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HEARING TO REVIEW THE FUTURE OF NEXT GENERATION BIOFUELS

HEARING

BEFORE THE

SUBCOMMITTEE ON CONSERVATION, CREDIT, ENERGY, AND RESEARCH

OF THE

COMMITTEE ON AGRICULTURE HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

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CONTENTS

Page

Goodlatte, Hon. Bob, a Representative in Congress from Virginia, opening statement 2
Holden, Hon. Tim, a Representative in Congress from Pennsylvania, opening statement 1
Prepared statement 2
Latta, Hon. Robert E., a Representative in Congress from Ohio, prepared statement 4
Peterson, Hon. Collin C., a Representative in Congress from Minnesota, prepared statement 4
Smith, Hon. Adrian, a Representative in Congress from Nebraska, prepared statement 5

WITNESSES

Tonsager, Hon. Dallas P., Under Secretary for Rural Development, U.S. Department of Agriculture, Washington, D.C.; accompanied by Todd Atkinson, Senior Advisor, Energy and Environment, Farm Services Agency, U.S. Department of Agriculture 5
Prepared statement 7
Shah, M.D., Hon. Rajiv, Under Secretary of Research, Education, and Economics, U.S. Department of Agriculture, Washington, D.C. 10
Prepared statement 12
Rosenthal, Mary, Executive Director, Algal Biomass Organization, Preston, MN 34
Prepared statement 35
Ellerbusch, Susan, President, BP Biofuels North America LLC, Warrenville, IL 36
Prepared statement 38
Roe, William J., President and CEO, Coskata, Inc., Warrenville, IL 43
Prepared statement 45
Jamerson, Bruce A., Chairman, Board of Directors, Mascoma Corporation, Lebanon, NH 50
Prepared statement 51
Shealy, L. Craig, President, CEO, and Co-Founder, Osage Bio Energy, LLC, Glen Allen, VA 54
Prepared statement 56

SUBMITTED MATERIAL

Gray, Ph.D., Kevin Gray, Chief Technology Officer, Qteros, Inc., submitted statement 71
Gutterson, Neal, CEO; and Ikonen, Greg, General Counsel, Mendel Biotechnology, Inc., submitted statement 72

HEARING TO REVIEW THE FUTURE OF NEXT GENERATION BIOFUELS

THURSDAY, OCTOBER 29, 2009

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON CONSERVATION, CREDIT, ENERGY, AND RESEARCH,
COMMITTEE ON AGRICULTURE,
Washington, D.C.

The Subcommittee met, pursuant to call, at 10:05 a.m., in Room 1300 of the Longworth Building, Hon. Tim Holden [Chairman of the Subcommittee] presiding.

Members present: Representatives Holden, Herseth Sandlin, Halvorson, Dahlkemper, Markey, Schauer, Kissell, Boccieri, McIntyre, Costa, Murphy, Peterson (*ex officio*), Goodlatte, Moran, Schmidt, Smith, Latta, Luetkemeyer, Thompson, Cassidy, and Minnick.

Staff present: Nona Darrell, Craig Jagger, John Konya, Robert L. Larew, James Ryder, Anne Simmons, April Slayton, Rebekah Solem, Patricia Barr, Josh Maxwell, Jamie Mitchell, and Sangina Wright.

OPENING STATEMENT OF HON. TIM HOLDEN, A REPRESENTATIVE IN CONGRESS FROM PENNSYLVANIA

The CHAIRMAN. This hearing of the Subcommittee on Conservation, Credit, Energy, and Research to review the future of the next generation biofuels will come to order. I would like to welcome our witnesses and guests at today's hearing to break our nation's dependence on foreign oil.

It is important to develop a diverse portfolio of energy alternatives including renewable, homegrown biofuels. Today we hope to hear about these energy programs and initiatives from both the Administration as well as industry representatives. In order to meet our commitment, it will take a public and private partnership. Congress has taken many positive steps to ensure a viable biofuels industry. Over the past few decades we have also seen an expanding list of Federal, state and local incentives, regulations and programs that have helped encourage renewable energy production and use.

I look forward to hearing about these initiatives from the Under Secretaries representing USDA this morning. The distinguished panel before us today also represents a broad cross-section of private companies on the frontier of next generation biofuels. While we have four companies represented on today's panel, we could have easily had 400, each with unique and exciting breakthrough

technologies that are being advanced in the next generation of biofuel development. I have had the opportunity to visit with and learn from many of these companies and look forward to continuing that work to highlight their good efforts in this field.

Today we hope to gain an industry perspective on current challenges and future opportunities in the renewable biofuels market, as well as the current state of public and private financing to make certain projects are online and production goals remain on track. While the market is rapidly growing and changing, significant challenges remain. In addition to a global economic downturn, the restrictive definition of *renewable biomass* and the required consideration of emissions related to advanced biofuels from indirect land use contained in the renewable fuel standard of the Energy Independence and Security Act of 2007 are problematic. I think we can do more to increase our use of renewable agriculture fuels and become energy independent, and I look forward to hearing from the witnesses and guaranteeing agriculture's continued role in producing renewable fuels and energy.

[The prepared statement of Mr. Holden follows:]

PREPARED STATEMENT OF HON. TIM HOLDEN, A REPRESENTATIVE IN CONGRESS FROM PENNSYLVANIA

I would like to welcome our witnesses and guests to today's hearing. To break our nation's dependence on foreign oil, it is important to develop a diverse portfolio of energy alternatives including renewable, home-grown biofuels. Today, we hope to hear about these energy programs and initiatives from both the Administration as well as industry representatives. In order to meet our commitment, it will take a public and private partnership.

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While the market is rapidly growing and changing, significant challenges remain. In addition to a global economic downturn, the restrictive definition of *renewable biomass* and the required consideration of emissions related to advanced biofuels from indirect land use contained in the Renewable Fuel Standard of the Energy Independence and Security Act of 2007 are problematic.

I think we can do more to increase our use of renewable agricultural fuels and become energy independent. I look forward to hearing from the witnesses and guaranteeing agriculture's continued role in producing renewable fuels and energy.

The CHAIRMAN. Now, I recognize the Ranking Member of the Subcommittee, the gentleman from Virginia, Mr. Goodlatte.

OPENING STATEMENT OF HON. BOB GOODLATTE, A REPRESENTATIVE IN CONGRESS FROM VIRGINIA

Mr. GOODLATTE. Well, thank you, Mr. Chairman, and I would like to thank you for holding today's hearing.

It is important that we review the future of next generation biofuels. Over the past couple of years, this Committee has thoroughly reviewed energy issues affecting rural America. Much of that discussion has been about the growth of renewable fuels and its opportunities and consequences for agriculture.

The Federal Government has played a big part in the early development of renewable fuels by creating an expanded Renewable Fuels Standard along with tax credits for ethanol, biodiesel and now advanced biofuels. This Committee worked to create a new energy title in the 2008 Farm Bill with the intent of helping the biofuels industry move towards the commercialization of advanced biofuels. However, the expanded RFS creates an unrealistic mandate for conventional corn ethanol by prohibiting the use of biomass from new crop acres. This restriction will make it difficult, if not impossible, for producers to meet the food and fiber demands of our consumers while also meeting the mandate set in the RFS.

We also face a major problem in the transition from grain-based fuels to cellulosic biofuels if we restrict the cellulosic feedstocks from forests and agricultural lands that can be used to meet the RFS. To meet the needs of our energy consumption and to open more markets for our agricultural products, it is essential that we move away from feed-based ethanol and develop commercially viable advanced biofuels. This technology has enormous potential to create renewable fuels across the nation, but these goals can only be accomplished if we develop a biofuels policy that works. That is why I cosponsored legislation with Chairman Peterson that removes indirect land use from the RFS lifecycle analysis and creates a new *biomass* definition, which expands the amount of eligible feedstocks that can be used to meet the RFS mandate.

We must continue to pave the way for second generation biofuels to create energy diversity and not limit our homegrown feedstocks. The use of forest biomass for biofuels creates markets for byproducts of forest improvement products. Almost ⅔ of the Commonwealth of Virginia is forested as is much of the southeastern U.S. Trees are an abundant resource and are available for conversion into both paper and biofuels year-round. Let me also add that like forestry biomass, Virginia's many agricultural commodities and animal waste products also have the potential to be essential and beneficial resources of a renewable fuel.

Additionally, I am also looking forward to the testimony from the witnesses about algae biomass. Research in this area is taking place in Virginia and, specifically, in my district at James Madison University. I have also had the opportunity to tour Solazyme, Incorporated in California, a leader in algal biotechnology. I believe that algal biomass has the potential to be a bridge technology between agriculture, energy and biotechnology, and I look forward to hearing more about the commercialization of this technology.

I also look forward to listening to how the USDA is working to fund the research and production of advanced biofuels. I am interested in learning more about how the private sector is investing dollars in the renewable energy sector. Today's hearing will help guide us in how we should shape future renewable energy programs.

Again, I thank you, Mr. Chairman, for holding this hearing and I look forward to hearing from today's witnesses.

The CHAIRMAN. The chair thanks the gentleman and would ask all other Members of the Subcommittee to submit their opening statements for the record.

[The prepared statements of Messers. Peterson, Latta, and Smith follow:]

PREPARED STATEMENT OF HON. COLLIN C. PETERSON, A REPRESENTATIVE IN CONGRESS FROM MINNESOTA

Thank you, Chairman Holden for holding this hearing today. Advances in the biofuels industry are transforming the way we think about energy production in the United States and around the world. The next generation of renewable fuels will be built on the success of corn-based ethanol and biodiesel, which means that we must continue to support the work of today's biofuels producers in order to give new technologies time for development and implementation. While roadblocks remain and critics still fail to recognize the improvements and advances the industry has already made, the promise of next generation biofuels is exciting, and it is my intention to do everything I can to see it succeed.

Government policies can either help or hinder advances in the biofuels industry. Right now, there are proposals out there and programs in place that do both. We created financing programs at USDA and the Department of Energy. However, not all of the funding that should be available to support the industry is getting out because of delays in rulemaking and regulations in place that put biofuels facilities at a disadvantage for some credit programs. The credit situation also changed after we wrote the farm bill programs, so access may be further limited, and I look forward to working with USDA to fix that. I am interested to hear from some of the companies here today about the challenges and opportunities they have experienced when trying to access the resources they need, both from government and private sources.

Another area where government policy could hinder the industry is in the form of ill-advised restrictions on biofuels based on international indirect land use calculations and restrictive definitions of *biomass*. We have discussed these issues in previous hearings, and I included language in the House-passed climate change bill to prevent such restrictions from stifling this growing industry. We can't expect the next generation of biofuels to materialize if we don't allow the industry to succeed in the first place.

Despite some roadblocks and challenges, there is some exciting research being done that can turn the promise of next generation biofuels into reality. Working together, government, academic and private research have made great strides in this area, and today we'll hear more about what this means for the future of the industry.

Thank you to our witnesses for joining us today, and I look forward to the testimony.

PREPARED STATEMENT OF HON. ROBERT E. LATTA, A REPRESENTATIVE IN CONGRESS FROM OHIO

Good morning, Chairman Holden and Ranking Member Goodlatte.

I would like to welcome our two distinguished panels of witnesses from the private sector and the USDA to discuss America's future on next generation biofuels. A simple premise in this day and age is that we cannot predict with any certainty what energy prices will be, what the supply and demand will be, or what our economy will look like in the future. Energy is plays a central role in our economy and alternative energy such as biofuels will directly impact the availability of jobs, our incomes and the quality of our lives for many years to come.

These sources of alternative energy are an important step towards energy independence. If we do not use these resources and address these issues now, the rest of the world will pass us by. The Fifth Congressional District in Ohio is ahead of the curve in alternative energy sources as it is home to solar panel manufacturing, wind turbines, ethanol, geothermal, and biodiesel. There is also a process for coal gasification and development of a hydrogen engine is also occurring in the Fifth Congressional District.

We are all aware that one source of energy is not one answer to our energy challenges. Our country needs not only biofuels, but also wind, solar, hydro in addition to nuclear, clean coal technology and more domestic oil and natural gas production. If we are going to achieve energy independence, we must use all available sources in a manner that is economically viable and environmentally sound.

I hope that today's hearing will help start moving our future use of biofuels and other sources of alternative energy in the right direction towards bringing jobs back, and bringing more alternative sources of energy to America and further developing the ones already in existence. The panelists who have been invited to testify have varied backgrounds will speak about various aspects.

Northern Ohio has a future in this country to be a leader in alternative energies such as biofuels. I look forward to hearing from our witnesses and thank you for your insight and testimony.

Thank you and I look forward to working with my colleagues on the House Committee on Agriculture on this very important issue.

PREPARED STATEMENT OF HON. ADRIAN SMITH, A REPRESENTATIVE IN CONGRESS FROM NEBRASKA

Thank you, Mr. Chairman:

In 2008, I supported a farm bill which promoted the critical, timely development of our nation's biofuels industry and confirmed Congress is serious about decreasing our dependence on foreign oil.

I have long advocated an all-of-the-above approach for America's energy policy. Advancing our nation's biofuels industry will have significant environmental benefits, promote energy independence, create jobs, and stimulate local economies across the nation at a time when our country needs it most.

I appreciate the Subcommittee holding this hearing to review issues facing the advanced biofuels industry. I look forward to hearing the observations and recommendations of our witnesses.

Thank you. I yield back.

The CHAIRMAN. We now welcome our first panel, Mr. Dallas Tonsager, Under Secretary for Rural Development in the United States Department of Agriculture, and Dr. Shah, Under Secretary for Research, Education, and Economics, U.S. Department of Agriculture. We also have Mr. Atkinson from FSA who is here with us today. We did not ask Mr. Atkinson to testify because the majority of jurisdiction will be with Rural Development but some Members of the panel might have a question or two for you, Mr. Atkinson.

Mr. Tonsager, you may begin when you are ready

STATEMENT OF HON. DALLAS P. TONSAGER, UNDER SECRETARY FOR RURAL DEVELOPMENT, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C.; ACCOMPANIED BY TODD ATKINSON, SENIOR ADVISOR, ENERGY AND ENVIRONMENT, FARM SERVICES AGENCY, U.S. DEPARTMENT OF AGRICULTURE

Mr. TONSAGER. Thank you, Mr. Chairman, and Members of the Subcommittee. I appreciate this opportunity to talk about second and third generation biofuels.

Accelerating the deployment of advanced biofuels is a high-priority for President Obama and for USDA. I know that this Subcommittee, and the Congress as a whole, share that commitment. You gave us a clear mandate in the 2008 Farm Bill and we look forward to working with you to get the job done.

I am privileged today to be testifying with Dr. Rajiv Shah, Agriculture Under Secretary for Research, Education, and Economics. Dr. Shah will describe REE's cutting edge research in both basic and applied science related to advanced biofuels.

There is exciting work going on as well elsewhere in the government, in the private sector, in the universities and abroad. The potential of advanced biofuels is widely recognized. The question that we all have, of course, is how rapidly can this potential be unlocked? Over the past decade, the United States became the world leader in biofuels, principally in corn ethanol. All of us recognize, however, that we have a remarkable opportunity today to diversify the feedstock base and add second and third generation biofuels to the nation's fuel mix. I am confident that this will happen.

This is essentially a story of converging cost curves. Since the beginning of this decade, we have witnessed the price of oil march from around $20 a barrel to nearly $150 a barrel 18 months ago and down to $78 a barrel yesterday. I do not know what the price of oil will be 5 or 10 years down the road, but I do know the recession is ending. Global energy and demand will continue to rise; environmental constraints will continue to intensify, and for all these reasons the need to commercialize advanced biofuels will continue to mount.

Our task is to help accelerate that transition. On May 5, 2009, the President's directive on biofuels and economic development mandated implementation of most of our new, renewable energy farm bill programs within 30 days. We met that target. In the Biorefinery Assistance Program, we have completed two application rounds, two awards have been announced and two more applications from initial rounds remain under consideration. As potential applicants gain familiarity with this program and as the national economy continues to recover, we anticipate continued growth and interest in applications in this program.

The Repowering Assistance Program is also on track. The farm bill made available $35 million in mandatory funding to remain available until expended. Of this total, $20 million was allocated for the initial funding round which was advertised in June of 2009, with the application window closing on November 1. As of October 28, one application has been received. We anticipate that a proposal and final rule be published in late 2010, with the remaining funds to be available at that time.

The Bioenergy Program for Advanced Biofuels provides payments for eligible agricultural producers to expand production of advanced biofuels. Funds are distributed for the previous year's production. We received 180 applications for Fiscal Year 2009 production, and of these 160 were deemed eligible. Thiry million dollars was allocated to Fiscal Year 2009, and production will be paid as a one-time payment during the first quarter of Fiscal Year 2010.

While not targeted specifically to advanced biofuels, the Rural Energy for America Program is also available as a potential source of support. From Fiscal Year 2001 through 2008, Rural Development invested over $195 million in 96 ethanol and biodiesel projects. Twenty-seven of these projects were funded through the Section 9006 Program. Biofuels are already an area of concentration and expertise and the transition to advanced biofuels is a logical evolution of the existing program.

Finally, as advanced biofuel technologies develop, we anticipate that many will become eligible for more conventional forms of financing including the Business and Industry Loan Guarantee Pro-

gram. In the long run, our expectation is that successful technologies will graduate to full private financing. We will have succeeded fully when our assistance is no longer needed.

In the short run, we still face an economic recession compounded by an unprecedented credit crisis. These factors have affected capital investment in all sectors including investment in new and emerging technologies, but these factors are inherently temporary. In the long run, all of us understand that advanced biofuels are a critical priority. The President and USDA are fully committed to the goal and we look forward to working with you to keep this vital initiative on track.

Thank you.

[The prepared statement of Mr. Tonsager follows:]

PREPARED STATEMENT OF HON. DALLAS P. TONSAGER, UNDER SECRETARY FOR RURAL DEVELOPMENT, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C.

Mr. Chairman and Members of the Subcommittee, thank you for this opportunity to appear before you to discuss the future of second and third generation biofuels.

President Obama and the Department believe that the research and commercialization of second and third generation has enormous potential to reduce our dependence on fossil fuels. The Department is anxious to work with other Federal agencies as well as the private sector the make this potential a reality.

I know that this Subcommittee, and a bipartisan majority in the Congress as a whole, share that commitment, as reflected in the Food, Conservation, and Energy Act of 2008 [2008 Farm Bill]. I therefore want to begin by commending your vision and leadership in this effort, and by acknowledging the critical contributions made by our partners elsewhere in government and in the private sector as well.

Today I will be discussing USDA Rural Developments advanced biofuels programs but I would be remiss if I failed to note that we are one part of much broader departmental and Federal effort. Secretary Vilsack has articulated a strategic vision for rural America that emphasizes a safe, abundant, and secure food supply; rural communities that are vibrant, self-sustaining, and repopulating; an emphasis on local and regional food networks; a commitment to economic opportunity and wealth creation in rural America; and a recognition of the importance of our nation's farms and forests in the global battle against greenhouse gas emissions. The transition to second and third generation biofuels is a key part of that strategy.

Advanced biofuels hold the potential to transform America's fuel supply, enhance our national security and energy security, reduce our carbon footprint, and foster economic growth in rural America. This is an enormous opportunity, and it will require the best efforts of many parties in many sectors—the Federal Government, national and university labs, state and local governments, and the private sector—to ensure that these multiple potentials are realized.

USDA is a leader in this area, on several fronts. I am privileged today to be testifying with Dr. Rajiv Shah, Agriculture Under Secretary for Research, Education, and Economics (REE). Dr. Shah will describe described REE's cutting edge research in both basic and applied science related to advanced biofuels.

At USDA Rural Development, in addition to our other economic development activities, we begin with the challenge of helping emerging renewable energy technologies become commercially viable. Once commercial feasibility is demonstrated, we support the build out of the advanced biofuels industries in rural communities. We work to ensure that agriculture producers, rural entrepreneurs, rural businesses, and rural communities share fully in the economic rewards of rural renewable energy.

America's—and the world's—energy systems are changing. This will be a long process requiring vision, determination, and leadership—but it is within our reach to give our children and grandchildren a cleaner, domestically produced, environmentally sustainable, and secure energy system. The Obama Administration is committed to that goal. We are laying the foundation now, and advanced biofuels are among the most important near-term deliverables in this long-term transformation.

Congress initially recognized this potential by providing, in the Farm Security and Rural Investment Act of 2002 [2002 Farm Bill] a first-ever energy title, which charged USDA with supporting the development of renewable energy in rural Amer-

ica. The 2008 Farm Bill built on that foundation and significantly expanded our authorities.

From Fiscal Year 2001 through Fiscal Year 2008, USDA Rural Development funded 2,489 grants and loans totaling over $860 million for renewable energy and energy efficiency projects. More than 100 of these projects and over $200 million of the funding were investments in biofuels. We are still validating the 2009 figures, which will—in a single year—add over 1,500 projects and more than $100 million in aggregate investment to the tally. No fewer than ten separate Rural Development programs contributed to these totals. Technologies funded ranged from biofuels and other biomass to wind, solar, geothermal, hydro, ocean, digesters, and landfill gas recovery systems.

This is already paying dividends. Since the beginning of this decade, the United States has become a leader in biofuels, wind energy, geothermal, solar thermal, solar photovoltaics and biomass.

Our topic today is advanced biofuels. A wide range of technologies are in play. These are at various stages of development. Some are maturing now and, [as Dr. Shah will discuss], we anticipate a continuous stream of innovation for the foreseeable future. Our task at USDA Rural Development is to identify viable technologies as they emerge from the labs and accelerate their deployment across the private sector.

In the 2008 Farm Bill, the Congress provided a powerful suite of programs to support this effort. On May 5, 2009, the President's Directive on Biofuels and Economic Development required USDA to implement many of our new renewable energy farm bill programs within 30 days. We met that target and are beginning to show results. I would like to give you a snapshot of where we stand today:

Section 9003: Biorefinery Assistance Program.

The Biorefinery Assistance Program (Section 9003) is targeted directly to the commercialization of second and third generation feedstocks. It provides loan guarantees for the development, construction and retrofitting of viable commercial-scale biorefineries producing advanced biofuels, and authorizes grants, subject to annual appropriations, to help pay for the development and construction costs of demonstration-scale biorefineries producing advanced biofuels.

Two application rounds have been completed to date. Two awards have been announced for a total of $105 million and two more applications from the initial rounds remain under consideration.

For Fiscal Year 2010, the farm bill provided $245 million in mandatory budget authority an estimated (approximately $691.6 million in loan guarantees). As potential applicants gain familiarity with this program and as the national economy continues to recover, we anticipate continued growth in interest and applications in this program.

Section 9004: Repowering Assistance.

The Repowering Assistance Program (Section 9004) provides payments for biorefineries (that were in existence at the time the 2008 Farm Bill was passed) to replace fossil fuels used to produce heat or power to operate the biorefineries with renewable biomass. The farm bill made available $35 million in mandatory funding to remain available until expended. Of this total, $20 million was allocated for the initial funding round, which was advertised in June 2009 with the application window closing November 1, 2009. As of October 20, one Section 9004 application had been received. We anticipate that a proposed and final rule will be published in late 2010 with the remaining funds to be made available at that time.

Section 9005: Bioenergy Program for Advanced Biofuels.

The Bioenergy Program for Advanced Biofuels (Section 9005) provides payments for eligible agricultural producers to expand production of advanced biofuels. The farm bill made available $55 million in mandatory funding for FY 2009, of which $30 million was allocated.

Of the 180 applications that were received for Fiscal Year 2009 production, 160 applications were deemed eligible. The contract period was from October 1, 2008 through September 30, 2009. We anticipate that the $30 million available to support Fiscal Year 2009 production will be paid as a one-time payment to eligible producers during the first quarter of Fiscal Year 2010. The remaining $25 million in unexpended FY 2009 funding plus the $55 million in mandatory funding for Fiscal Year 2010 will be available for payment in the first quarter of Fiscal Year 2011 once the public has commented on a proposed rule and a Final Rule has been issued.

Section 9007: Rural Energy for America Program.

The Rural Energy for America Program (Section 9007) expands and renames the program formerly called the Renewable Energy Systems and Energy Efficiency Improvements Program (Section 9006). This program has provided grants and loan guarantees for energy efficiency and renewable energy projects ranging from biofuels to wind, solar, geothermal, methane gas recovery, and other biomass projects. Under the 2008 Farm Bill, hydroelectric and ocean source technologies were added as eligible purposes.

For Fiscal Year 2010, the farm bill provided $60 million in mandatory budget authority. The Fiscal Year 2010 agriculture appropriation, Public Law 111–80 provides an additional $39, million in discretionary budget authority.

While not targeted specifically to advanced biofuels, the Section 9007 Program is a potential source of support once advanced biofuels technologies mature. To be eligible, a project must be commercially viable. From Fiscal Year 2001 through 2008, Rural Development invested over $195 million in 96 ethanol and biodiesel projects. Twenty-seven of these projects were funded through the Section 9007 program.

Other Rural Business Programs.

Looking ahead, as advanced biofuels technologies develop, we anticipate that many will become eligible for more conventional forms of financing once they become commercially viable, including USDA Rural Development's flagship business development program, the Business and Industry Loan Guarantee Program (B&I). In the long run, our expectation is that successful technologies will graduate to full private financing. We will have fully succeeded when our assistance is no longer needed.

In the short run, we still face an economic recession compounded by an unprecedented credit crisis. These factors have affected capital investment in all sectors, including investment in new and emerging technologies.

At the same time, commodities prices have been unstable. The conventional ethanol industry has been impacted over the past year, first by a spike upwards in feedstock prices and then by a recession-induced collapse of oil prices. Stability and profitability is returning to that industry, but we are still working our way through a difficult period.

Finally, there is a degree of policy uncertainty that is affecting current investment decisions. The President is committed to vigorous and effective action to reduce the nation's carbon footprint. The time is now for the United States to lead in the effort to reduce greenhouse gas emissions. Enactment of the President's climate change initiative is important for many reasons. Acceleration of the deployment of advanced biofuels is one of them.

In closing, it is important to note that these challenges and uncertainties are inherently temporary. In the long run, all of us understand that we will continue to face the national security imperative of diversifying away from oil. We will continue to face the environmental imperative of reducing greenhouse emissions. And as the global economy rebounds, we will potentially face the supply constraints that pushed the price of oil from less than $20 a barrel a decade ago to nearly $150 a barrel just over a year ago.

We will continue to live in global economy, which will place ever-increasing pressure on commodities prices and legacy business structures. The need to diversify our energy choices and explore new technologies is clear, and advanced biofuels will play a strategic role in ensuring our competitiveness and prosperity in the years to come.

For all these reasons, we are investing now in new technologies that will pay dividends for decades to come. There are always uncertainties. There will always be surprises. Neither markets nor technologies are static. But we are clearly reaching the point at which biofuels will soon be cost competitive with conventional oil, and the trend lines are clear.

This is an area where the United States is already a world leader. We are operating from a position of strength. The Congress clearly defined the objective in the 2008 Farm Bill, and the Obama Administration is fully committed to the goal. The present difficulties notwithstanding, I am optimistic about the future, and I look forward to working with you to keep this vital initiative on track. Thank you.

The CHAIRMAN. Thank you, Mr. Tonsager.

Dr. Shah.

STATEMENT OF HON. RAJIV SHAH, M.D., UNDER SECRETARY OF RESEARCH, EDUCATION, AND ECONOMICS, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C.

Dr. SHAH. Chairman Holden, Ranking Member Goodlatte and distinguished Members of the Committee, I appreciate the opportunity to discuss the future of second and third generation biofuels with you.

I am pleased also to share this panel with my colleague, USDA Under Secretary for Rural Development Dallas Tonsager. I appreciate his remarks and I believe we are building a strong partnership in this area.

Mr. Chairman, Congress has laid out a significant challenge in producing 36 billion gallons of biofuel by 2022. This is a substantial goal but one that we can meet or beat. However, I believe to achieve this goal we will need to dramatically expand our focus on second and third generation fuels, and dramatically expand our research portfolios in these areas. In particular, we will need to focus on third generation fuels. These are fuels that can directly substitute for gasoline, jet fuel and diesel and take advantage of America's tremendous existing fuel infrastructure.

Today more than 9 billion gallons of biofuel are produced annually by first generation technologies that turn corn grain starch into ethanol. This is a compliment to American farmers in the ethanol industry. Ethanol has rapidly grown from meeting one percent of U.S. gasoline supply in 2000 to seven percent in 2008. A number of factors contributed to this outcome. American farmers knew how to efficiently produce corn and technology for producing corn ethanol already was available. Also, increased corn acreage supported greater ethanol output.

The forward-looking legislation that Congress passed in the Energy Independence and Security Act of 2007, stipulated that only 15 billion gallons of the 36 billion can be provided by ethanol produced from grain. This means that 21 billion gallons of biofuel will need to come from sources other than grain. Second generation technologies could turn crop residue and dedicated energy crops such as perennial grasses or woody biomass into ethanol. And third generation technologies would turn a variety of feedstocks directly into advanced fuels that can directly substitute for existing fuels.

To meet these targets, we will have to accelerate our efforts to create and deploy these technologies. Our research portfolio has funded thousands of worthy projects, but there has been less effective integration of these efforts across government agencies, and there has not been sufficient focus of partnering public and private resources to develop economically viable biofuel supply chains. For example, we are not doing enough to create high-performing, dedicated feedstocks that are regionally advantaged in order to maximize yields and minimize the cost of biomass transport, as well as provide farmers opportunities to capture more of the value chain and hence earn greater profits. In addition, market incentives may be necessary to encourage innovation in business models for second and third generation fuels.

Our current research programs are important, but are not sufficiently focused on the key gaps in the supply chain for second and third generation fuels. We are in an active process of reviewing our

research portfolio and making significant changes. In this spirit, I am committing significant resources from both our intramural and extramural research assets to those areas where science can make significant contributions, and where USDA has important core competencies primarily in the areas of dedicated feedstocks and conversion byproducts. In fact, the amounts of biomass and other dedicated energy crops that are needed to produce second and third generation biofuels amount to the creation of an entirely agriculture commodity sector, and we are not doing nearly enough to bring this along. Our research priorities will accelerate in perennial grasses, sorghum, woody biomass, energy cane and oil sea crops including algae.

As markets for some U.S. commodities decline, farmers and foresters are seeking new opportunities for wealth. Dedicated energy feedstocks are amongst the most promising. There are many agronomic, geographic, economic and environmental uncertainties that need to be addressed to promote each of these new energy crops. We intend to focus on and address these uncertainties. Our Agricultural Research Service scientists in the private sector have made significant yield improvements in a number of crops, most notably corn and soybeans. This knowledge along with important recent discoveries in genomics can be leveraged for energy crops.

As land use patterns respond to increasing use of farm and forestland for biofuel feedstock production, ancillary actions may also be necessary to avoid serious impacts on food, feed and fiber prices and environmental quality. The Agricultural Research Service, the Economic Research Service and our university partners supported through the National Institute of Food and Agriculture are conducting research and developing decision tools that will help design the most economic ways to produce and harvest biofuel feedstocks while protecting natural resources. Recent research has produced guidelines for harvesting crop residue so that we protect against soil and water erosion, and ensure soil carbon levels are maintained at high enough levels to ensure that genetically improved varieties can reach their productive potential. In addition, new kinds of contracts between energy crop producers and conversion facility operators will be needed to provide markets for feedstocks to encourage the investment for building biorefineries, and to ensure that uninterrupted supplies of feedstock are available.

As more and more of our fuel supply comes from biofuels, we will need to continually improve the production practices in order to produce more on the same amount of land, and enhance the production of high-value co-products in feedstocks that are then recovered as part of the biofuel production process. Along with my colleagues at USDA, we have begun dialogues with our counterparts at the Department of Energy about ways in which we can better coordinate our programs and our research grants. Already, NIFA and DOE's Office of Biomass Programs have worked together to award up to $25 million in biomass research and development initiative grants. We also together award $6.3 million in genomics-enabled research for biofuels.

I appreciate the opportunity to testify before this Subcommittee today and I look forward to working with you, Mr. Chairman, Ranking Member and all the Members of this Subcommittee as we

continue to work hard to meet the goals that you have set and we appreciate your support.

Thank you.

[The prepared statement of Dr. Shah follows:]

PREPARED STATEMENT OF HON. RAJIV SHAH, M.D., UNDER SECRETARY OF RESEARCH, EDUCATION, AND ECONOMICS, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C.

Chairman Holden, Ranking Member Goodlatte, and distinguished Members of the Subcommittee, I am Rajiv Shah, Under Secretary for Research, Education, and Economics. I oversee four agencies: the Agricultural Research Service; the Economic Research Service; the National Agricultural Statistics Service; and the National Institute of Food and Agriculture (NIFA). I appreciate the opportunity to discuss the future of second- and third-generation biofuels with you.

I appreciate the opportunity to share this panel with my colleague, USDA Under Secretary for Rural Development, Dallas Tonsager. He has taken a leadership role in helping to ensure that people throughout rural America can build this new capability to produce and deliver biofuels to the market. He will share with the Committee the various mechanisms the Department has to support bioenergy commercialization so I will not repeat them, except to say that our work with Under Secretary Tonsager is fully complementary and fully aligned with the same goals of U.S. energy security.

Without their work in commercializing biofuels and developing markets to realize rural wealth, our research on biofeedstock development and cultivation won't ensure the energy security biofuels can bring. Promising developments in the laboratory or inventions by a farmer or an aspiring entrepreneur will simply never see the light of day. Innovation and our ability to meet the food, fuel and fiber needs of the country will come from all sorts of places and we need to incubate those technology breakthroughs as well.

Mr. Chairman, Congress has laid out a significant challenge to produce 36 billion gallons of biofuels by 2022 to power our cars, trucks, jets, ships and tractors. This is a substantial goal, but one that the United States, with the help of American agriculture, can meet or beat. However, I believe to achieve this goal the Federal Government needs to expand our focus on drop-in or third generation fuels. These are biofuels that can directly substitute for gasoline, jet fuel, and diesel.

Today more than 9 billion gallons of biofuels are produced annually by first-generation biofuel technologies that turn corn grain starch into ethanol. This is a significant accomplishment and a compliment to American farmers and the ethanol industry—ethanol biofuel has rapidly grown from meeting 1% of the U.S. gasoline supply in 2000, to 7% in 2008.

A number of factors contributed to this outcome. American farmers knew how to efficiently produce corn, the technology for producing corn starch-based ethanol already was available, and—very importantly—increased corn acreage supported greater ethanol output. Also, ethanol quickly solved an environmental problem by being a suitable replacement for a gasoline additive called methyl tertiary butyl ether (MTBE) that created water quality concerns and was taken off the market. All of these factors combined helped to establish corn grain ethanol in the market.

The forward-looking legislation that Congress passed in the Energy Independence and Security Act of 2007 (EISA) stipulated that only 15 billion gallons of the 36 billion can be provided by ethanol produced from grain, or what is called first-generation biofuel. This means that 21 billion gallons of biofuels will need to come from sources other than corn grain. Second-generation biofuel technologies that turn crop residue such as corn stover or dedicated energy crops such as switchgrass into ethanol, and third-generation biofuel technologies that turn these feedstocks into advanced biofuels—synthetic substitutes for gasoline, jet fuel, and diesel—will have to come rapidly into commercial use.

If we are to reach our target of 36 billion gallons of biofuels by 2022, we will need to change the way we do business. The U.S. has funded thousands of worthy projects, but there has been little effective integration of these efforts across government research agencies, and there has not been a focus of partnering with public and private resources to develop biofuel supply chains capable for achieving Congress's goals. Significant parts of the supply chain have been ignored or have received too little attention such as sustainable feedstock production systems, solutions to lower the cost of biomass transport, and efforts to enhance compatibility with America's existing fuel distribution and utilization systems.

To accomplish the Congressional Mandate we need to accelerate the establishment of a sustainable commercial biofuels industry. This will require that we create an overall strategy that builds on the core competencies of all contributors, and integrates all Federal-funded project activities across all supply chain elements.

We need this now more than ever, so that we can unleash the creativity and skills of people in government, in college laboratories, in the garages of aspiring entrepreneurs, and in the R&D facilities of the private sector.

When last I came before this Committee in September, I pledged that I would use my role as Chief Scientist of USDA to sharpen our focus and leverage our expertise and our resources where they would make the most difference. In this spirit, I am allocating significant resources from both our intramural and extramural research assets where scientific breakthroughs can make significant contributions to the emerging biofuels industry, and where our core competencies can have the most impact.

For example, the use of biomass and other dedicated energy crops to produce second- and third-generation biofuels could potentially create an entirely new agricultural commodity sector. There are many economic and environmental uncertainties to be expected as this potential sector emerges. We intend to focus on feedstock development for a range of first-, second-, and third-generation bioenergy crops. We will continue to work in corn—where our Agricultural Research Service scientists have made important recent discoveries in genomics. And we will build a robust research portfolio in perennial grasses (like switchgrass and miscanthus), energy cane, sorghum, and other potential dedicated feedstocks. The Federal Government must also invest in technologies that improve the economics for producers and consumers alike, and lead to greater wealth creation in rural communities.

As land use patterns respond to increasing use of farm and forestland for biofuel feedstock production, ancillary actions may be necessary to avoid serious impacts on food, feed, and fiber prices, and environmental quality.

The Agricultural Research Service, the Economic Research Service, and our university partners supported through the National Institute of Food and Agriculture (NIFA), along with other Federal and state departments and agencies, are conducting research and developing decision tools that will help design the most economical ways to produce and harvest biofuel feedstocks, while protecting natural resources. Recent research has produced guidelines for harvesting corn stover residues so that not only is the soil protected from water erosion, but also to ensure soil carbon levels are maintained at high enough levels to ensure genetically improved varieties can reach their productive potential.

As more and more of our fuel supply comes from biofuels, we will need to continually improve the genetics of the feedstocks grown and the production practices we use to not only produce more on the same amount of land, but to enhance the production of high-value co-products in feedstocks that are then recovered as part of the biofuel production process.

Along with my colleagues at USDA we have begun dialogues with our counterparts at the Department of Energy and other Federal Departments about ways in which we can better coordinate our programs and our grants to realize the full potential of biofuels. For example, NIFA and DOE's Office of Biomass Programs have worked together to award up to $25 million in Biomass Research and Development Initiative competitive grants to support the development of feedstocks, biofuels, and biobased products.

Also, to ensure continued genetic improvement of bioenergy crops, NIFA and DOE Office of Science have partnered to fund seven projects totaling $6.3 million for fundamental science to accelerate plant breeding programs by characterizing the genes, proteins, and molecular interactions that influence biomass production.

I appreciate the opportunity to testify before this Subcommittee today, and I look forward to working with you, Mr. Chairman, Ranking Member, and all the Members of this Subcommittee as we in Agriculture Research, Education, and Economics continue to work hard and make our contributions to help meet the goal of 36 billion gallons of biofuels in 2022. And we appreciate the support you have given us to accomplish that. This concludes my statement.

The CHAIRMAN. Thank you, Dr. Shah.

Mr. Tonsager, during the last farm bill, Chairman Peterson, Mr. Goodlatte, myself and Mr. Lucas, and Members of the Committee worked hard to make sure that the Loan Guarantee Program was administered by USDA because quite frankly, we knew of the nightmare that was going on in DOE. We didn't want this loan guarantee program to suffer the same bureaucratic nightmare. But,

we are hearing complaints about the implementation of the loan guarantee program. So is there anything that we can further do to help you and how much money has been obligated? How many Loan Guarantee applications have you processed and how many are in the pipeline?

Mr. TONSAGER. There are some aspects I would like you to consider. I have had some time in the credit world having been on the board of the Farm Credit Administration. The current credit circumstances nationally are very challenging. We, of course, have a corn-based ethanol industry that I am pleased to say is starting to turn around and looking better. I think we have seen some fundamental shifts that have occurred in this area. There are significant amounts of credit extended to the corn-based industry that helped take it off the ground. Risk was taken at the time.

At this point, as we develop the cellulosic and biofuels industry, as we look at how we take risk and how much it is a challenge. How do we persuade this credit industry that is looking at how they have gotten through the ethanol industry, and the ups and downs we have gone through this past year, to look at these new technologies and gauge the amount of risk that we are willing to ask these lenders to take, as opposed to the risk we are willing to take with them. And quite frankly, at this moment very few credit providers, even with loan guarantees, are willing to take much risk at all. I think we may need to review this and seek some additional broadening of our ability to take risk if we are going to get some of these projects off the ground. We may be coming back to you to explore some of those individual calculations that we look at such as the percentage of risk we take and so forth.

I would suggest that, as is recognized in the Biorefinery Assistance Program, there is a recognition of the need for taking greater risk, and for a greater budget authority made available to support that risk-taking. But at this point it is very difficult to find creditors who are willing to step up even with our loan guarantee programs to take substantial risk.

The CHAIRMAN. Has there only been one loan guarantee granted? Is that the one in Georgia?

Mr. TONSAGER. We have issued two conditional commitments for loan guarantees. One was for $80 million and another for $25 million, where we have issued conditional commitments and said we will make this guarantee if you meet our conditions.

The CHAIRMAN. And one is in Georgia and where is the other one at?

Mr. TONSAGER. In Minnesota.

The CHAIRMAN. In Minnesota.

Dr. Shah, you talked about your relationship with DOE regarding research. Can you expand on that a little bit? How closely are you working together with them?

Dr. SHAH. Thank you. We certainly can. I would start by noting that the GAO had a study on this topic in R&D Biomass and noted that DOE spent in 2008, $460+ million compared to USDA's approximately $40 million. And while I think that underestimates our current investments, for a number of technical reasons we felt early on it was important to partner with DOE to make sure that we were, together, setting the right biomass and bio-feedstock pri-

orities, driving our investment into those areas where we have real core competencies and frankly, steering some of their investments into those same areas with us. So we have had an ongoing dialogue with the Department of Energy both the Office of Science and the office that oversees biofuel, biomass. We have come to some preliminary conclusions that we should each focus on some of our core competencies, so if they accelerate their investments and conversion, we would accelerate our investments and be more focused on feedstock.

We would like to work in closer concert to make sure that we are doing that hand-in-hand, especially in the second and third generation and dedicated feedstock business model, so that the conversion technologies that are created are specifically adapted to the types of crops, including the ones that I mentioned, that we are accelerating our development of. Working together we can try to bring in, in the next 5 to 7 years some very meaningful and cost-efficient models that integrate both bio-feedstock production, conversion and actually testing of business models that would deal with issues like the transport costs of the biomass.

The CHAIRMAN. And finally for both of you, we hear the Administration talk an awful lot about alternative energy. I am a little more partial to coal then they are but we hear them talk about wind and solar. I am just curious, how much of a seat at the table does agriculture have when you are talking to people in the Administration to get a commitment, a real commitment from them?

Dr. SHAH. I think we have a significant seat at the table. Secretary Vilsack and Secretary Chu and EPA Administrator Jackson are the Co-Chairs of the Biofuel Task Force at the Cabinet-level. Through that task force the Department of Agriculture has had the opportunity to work very closely with the Department of Energy on thinking through the broad strategic approach. And I also believe that the very specific focus on the quantitative targets in biofuels has created a lot of space for us to work with them in a more expansive way about how we would achieve that.

Mr. TONSAGER. I would agree. I think Secretary Vilsack has been an extremely strong advocate both internally and in the Administration. I will be co-chairing the Biomass Research Development Board along with a representative from the Department of Energy, and Dr. Shah will be my partner in that as we get that effort refocused and moving forward again.

The CHAIRMAN. Thank you.

Mr. Goodlatte.

Mr. GOODLATTE. Well, thank you, Mr. Chairman.

Gentlemen, welcome to you all. I have had the opportunity to meet with Dr. Shah recently, and he has also testified before the Committee earlier. I am very excited about his interest in research, particularly in this field that we are talking about today. He also brings a unique background with his previous work for the Bill and Melinda Gates Foundation and we are very appreciative of his efforts now on behalf of research in the Department of Agriculture. And thanks to Congresswoman Herseth Sandlin, I have had the opportunity to know Mr. Tonsager for a number of years, and you are now responsible for an organization that I am very fond of. You have done great work in Virginia, particularly in the rural areas

and small towns in my Congressional district in helping with economic development, so thank you for undertaking that task, as well.

I want to start out by asking you why only two awards have been made under the Biorefinery Assistance Program. Is there a lack of interest in the program or just a lack of financing due to the current credit environment?

Mr. TONSAGER. I think there are several challenges that we are faced with and one is very much the current credit environment. We had great energy and motivation in the creation of the corn-based ethanol industry. There was a real tie-in with the producers who managed it. From my perspective the Farm Credit System at that point, and certainly other lenders in rural America as well, had great emphasis, a great driving desire to build the industry. It was built. It was successful for awhile. It has been through a huge up and a huge down so those same credit providers who carry these skill sets are reluctant to really step forward at this point.

Additionally, the proposals we are seeing are highly capital-intensive. The corn-based ethanol industry was built to a large degree for about $2 to $2.50 per gallon on construct cost. We are seeing proposals that are several multiples of that for the capital investment necessary to do cellulosic plants. And so, of course, you are taking larger, greater risk on larger projects. So, we have to be measured and we are looking for business plans that can be highly successful.

We don't want to come out of the chute and not have a success, so we very aggressively want to take risk. We want to assert ourselves. We are looking for the opportunities because we want to get this industry off the ground, but we have to look carefully at the projects that are proposed. We have to think strategically to make sure, as we go forward, that we have some confidence that they can be successful.

Mr. GOODLATTE. Is there anything more that your agency or the Congress needs to do to make this program successful?

Mr. TONSAGER. I think we are going to be aggressively looking for ways to have that dialogue. Well, we know we can have that dialogue, but we are aggressively looking for ways to make that work. I think the experience of building the ethanol industry originally was producers at that time stepped up, got together with farm cooperatives and formed other business associations. There was wide investment by many individuals into the ventures. The risks that were taken by lenders were widely distributed through the economy, and we have to look for ways to make that same kind of environment occur now. Obviously, we will have large companies that want to do projects and we will support that. I think all of us would really like to see, if we are successful, the success distributed widely through our rural economy with other people that can participate. I am advocating that we want to build this industry. We want to look for ways to spread the opportunity for people to be part of that industry, and to do that we have to develop mechanisms where risk-taking can be answered.

Mr. GOODLATTE. Let me ask you about the two projects that have been funded. Are they demonstration projects or commercialized projects?

Mr. TONSAGER. They are demonstrations with a focus of moving to commercialization. We have grants from the Department of Energy involved with them in some cases, and we have some risk-taking on the part of USDA in one case or both cases. So the question becomes how far do you go? At what point do you take 100 percent of the risk of creation of the project? Do you have an expectation that the investors in this take some portion of the risk?

Mr. GOODLATTE. Are they commercialized projects or demonstration projects?

Mr. TONSAGER. The goal of one is to demonstrate and then commercialize. They have to go to a commercially-viable scale, when we look at them, they have to become commercially viable as part of the process.

Mr. GOODLATTE. And let me ask you about the 20 applications that you indicated were ineligible. Now, is there a common criteria that these applicants fail to meet?

Mr. TONSAGER. Two things occured: one is that several of them did not meet the technical requirements that we put on them to look at. Seven of them did not actually have a lender in place. They made an application and part of the process is our applicant is usually the lender. In this case, they put forward applications without lenders.

Mr. GOODLATTE. Thank you very much, Mr. Chairman.

The CHAIRMAN. The chair recognizes the Chairman of the full Committee, Mr. Peterson.

Mr. PETERSON. Thank you, gentleman, and I thank the Chairman and Ranking Member for their leadership in calling this hearing.

Dr. Shah, I don't want to pick on you but you were accurate when you said that there was an increase in corn acres. But, I want to put this in perspective, because virtually there wasn't and this is a myth that has been put out there by some people, I think.

You go back to 1977, and we had the 84.3 million planted acres and in 2009, it was 86.4 so we are virtually using the same corn acres that we did way back in 1977. The big difference is we had a 100 bushel average or actually 90.8 in 1977, 101 bushels in 1978, and today we are up to 164 bushels. Now, anybody that knows anything about what is going on understands that we are going to have a significant increase in yields here in the next number of years, a few years. So we are not going to increase acres.

The way we are going to provide these feedstocks in corn ethanol, and a lot of these guys are going to be going into cellulosic, is by this increased yield. So all of this foolishness about international land use and what is going on in Brazil and all this other negative stuff that is being put out by different interest groups that have different agendas, God only knows, there might be 20 different agendas going on here that are after us for different reasons. I mean it is no damn wonder that nobody is investing. I wouldn't put money in with all of this stuff that is going on, and I think that is a lot of what is happening here. People that want cellulosic ethanol have to get real about this and realize that we are the people that went in corn ethanol. That created the opportunity for us to even do this, and a lot of these plants are going to be the first ones that do cellulosic on a commercial scale.

We are converting our plants to use biomass for energy and so forth, and that word is not getting out to the public. All they hear about is how terrible it is, how we are going to starve everybody, and all this other baloney that is out there. So, I just think that there are some positive signs that are happening here all of a sudden and hopefully we will be able to turn this around.

It doesn't help that we are having such a struggle to try to get the blame all up and all these other things, so I wouldn't blame you folks for what the problem is. I think you are doing what you can do, but I am glad to hear that you are not going to go out and make investments in projects that have too much risk. I think there are a lot of snake oil salesmen out there. There is a lot of due diligence that you guys need to do to make sure we are doing the right kind of projects and eventually we are going to get there. But for people that are listening that have been on the other side of this, I think that if you want to get to the next generation, you are doing us all a disservice by ginning up all of these bogus arguments that we have been hearing. I guess that is not a question, I am just getting it off of my chest.

The CHAIRMAN. I thank the Chairman, and recognize the gentleman from Nebraska, Mr. Smith.

Mr. SMITH. Thank you, Mr. Chairman, and I thank you today, the Chairman of the full Committee for elaborating on some concerns that I would share, as well.

But to another more specific topic though, Dr. Shah, you mentioned in your remarks that there are some infrastructure setbacks relating to biomass transport, and certainly I share that concern. I shared that concern actually during the farm bill debate in Committee, and I was grateful that the Committee accepted an amendment that I offered relating to R&D for the byproducts of the biofuel industry. Can you elaborate, perhaps, on the steps that the USDA is taking in terms of improving industry-wide infrastructure and the cooperation along the way?

Dr. SHAH. Well, thank you for that. I think as we look industry-wide we take a supply chain analysis to either first, or second and third generation systems, we look at feedstock, at conversion, at byproducts, and at transportation and logistics, of course, and it is part of every step of that process. So what the Economic Research Services is trying to do is creating a business model to understand what do the economics of these different systems look like? Where are the biggest and the highest cost points with respect to transport and logistics, and then how would that potentially guide our research investments, whether you might make accelerated investments in pretreatment or farm-based treatment of biomass to reduce the cost of transport, or whether you would promote business models that are more geographically focused so that you actually have less physical transport to deal with. And then you are working on conversion technologies that can operate at different levels of scale, particularly lower levels of scale so that you don't have to deal with the high cost of transporting biomass through large distances.

As we do this work, there are two things I would just add, one is you mentioned partnerships and we are working very closely with the private sector to identify how we can pursue research in

these areas in a more effective way. And I am glad that you have a number of private sector firms speaking with you today since we have been working with many of those same firms to make that joint identification.

What we tend to be hearing is that people are asking us to work especially aggressively on the feedstock and the byproduct side but especially in the feedstocks. If we are going to have viable second and third generation systems, we actually need viable crops. We need more adapted varieties of the various feedstocks that I mentioned, and currently we are not doing nearly enough in that area. Even in the $25 million 9008 Program that I mentioned, a very small percentage of that, only about $5 million of that is going directly to feedstock improvement. So, we are trying to reassess how we can focus more aggressively on feedstocks to help bring the risks down for some of these projects and to do that in a way that is consistent with the transport and logistics concerns.

Mr. SMITH. Thank you very much. I appreciate that. Now, I do want to add emphasis, or maybe repeat what the Chairman of the full Committee mentioned in terms of indirect land use. I don't think we should defer our regulatory say to other countries, and I am grateful that USDA is on top of things relating to that. Perhaps we can convince some other agencies, as well.

Thank you.

The CHAIRMAN. The chair thanks the gentleman and recognizes the gentlewoman from South Dakota.

Ms. HERSETH SANDLIN. Thank you, Mr. Chairman, and I would first like to associate myself fully with the comments of the full Committee Chairman, Mr. Peterson. I want to thank all of you for being here today.

Dr. Shah, if I could start with you, I want to thank you and your staff for recently meeting with the leadership of the Sun Grant Initiative with whom I have worked for a number of years now. As you know, the Sun Grant Initiative was reauthorized with the help of both Mr. Peterson and Mr. Goodlatte in the 2008 Farm Bill. I raised the work that the Sun Grant Initiative was doing with Secretary Vilsack when he was recently in South Dakota earlier this month, and as you also know, the program received $2.25 million in Fiscal Year 2010 Agriculture Appropriations. They are conducting important research that holds tremendous potential to improve the domestic supply of renewable energy. Much of that research, of course, is focused on feedstocks. They are a competitive grant program and I was wondering how you see the Sun Grant Initiative fitting in with the research priorities at USDA in light of the coordination that you are doing with DOE and your agency, specifically focusing on feedstock research?

Dr. SHAH. Well, I would make a few points. The first is thank you for those comments. I had the chance to meet with them myself and my staff has also met with them specifically. I also hope in the very near future to get out to South Dakota and to visit, and I potentially have a host here to my right who may enable that and so I look forward to that.

Our goal is to dramatically expand the investment in feedstocks and a broad range of feedstocks, and to use competitive vehicles for doing that. And so what we hope to do is use the AFRI-window of

the National Institute of Food and Agriculture, and we are fortunate to have Dr. Robert Beachy leading this as the Director of NIFA, the National Institute. Through that we would have broad competitive opportunities for a broad range of market participants to significantly expand their work in feedstocks. But we want to implement that in a way that is very regional in its focus so that we know that we are targeting regions with crops that are most interesting to and most effective, potentially, in future second and third generation systems. I think many of the partners of that effort would be able to compete and would be able to be a part of that initiative.

We are also looking very carefully and more specifically at the Sun Grant Initiative as it is currently structured. And while I don't have a direct answer to it yet, we will probably get there in the next month or two in terms of knowing how we will take that forward.

Ms. HERSETH SANDLIN. Thank you, Dr. Shah.

Mr. Tonsager, it is great to have a fellow South Dakotan and good friend as the head of Rural Development. And I thank you for the work that you have already done in the timely implementation of the new energy programs and the farm bill, 2008 Farm Bill as well as the significant investments that you are making in renewable energy and the energy efficiency programs throughout rural communities.

If I could focus on the blend wall issue that Mr. Peterson referenced. Can you confirm for me, I know that Secretary Vilsack is optimistic that we will have a favorable decision and it will be by December 1. Can you confirm for me the role of USDA in that decision to move from E10 to E15, and that that decision is on, and continues to be on, a time-frame of December 1?

Mr. TONSAGER. I am unsure of the decision time-frame. Secretary Vilsack has been personally engaged with advocating for that change and, of course, those of us who want to see a progression of the ethanol industry hope that that can happen. We are looking forward to it. I see the role of my agency in these matters as to constantly trying to assert ourselves in whatever situation evolves. Science has served agriculture extremely well. Science has served the cause of ethanol and the development of ethanol. So whatever decisions come, you can be assured in our agency that we are going to be continuing to move forward aggressively on all fronts related to biofuels production.

Ms. HERSETH SANDLIN. Thank you, and then finally the issue of indirect land use that both Mr. Peterson and Mr. Smith mentioned. Could you elaborate either one of you, on the role that you USDA had in the peer review process, and whether or not USDA is involved with the EPA as they are moving forward with the RFS2 rulemaking, in light of the concerns raised about this issue?

Dr. SHAH. I do know I am not able to answer the specific question about the specific nature of the involvement, but we have been involved both through our Economic Research Service and I believe the Office of the Chief Economist and other aspects of USDA in working with them on the issue and the rulemaking overall. As you know, the core issue and some of them are around how they define baselines and other aspects of that. I would just say that I will

take this opportunity to agree largely with the Chairman's comments about the potential for yield and the potential for more micro-agronomic improvements that are not often factored into the generic discussion. And so we are trying to help offer that technical guidance and expertise that there are different types of production systems. When you look at this with a more careful analysis of the baseline, and a more careful analysis of the specific production systems and specific areas, you sometimes come to very different conclusions.

Mr. TONSAGER. And if I could, the Chief Economist at USDA has been leading the charge in that relationship.

Ms. HERSETH SANDLIN. Mr. Chairman, thank you. I think it is important that USDA's technical expertise and knowledge be highlighted in this process. As we have seen from earlier testimony from officials at EPA, their understanding of agriculture and familiarity with what has been happening and the technological advancements heightens the concerns that we all have. It is good to hear that our folks who are at USDA have been aggressive in being involved in that process. Thank you.

The CHAIRMAN. The chair thanks the gentlewoman and recognizes the gentleman from Louisiana.

Mr. CASSIDY. Thank you, Mr. Chairman.

A couple questions, the Biomass Crop Assistance Program, the question is, is it going to be adequately funded and do we have a sense of when the funding will come and how much the funding will be for that?

Mr. TONSAGER. Which program? I am sorry.

Mr. CASSIDY. The Biomass Crop Assistance Program.

Mr. TONSAGER. I have not considered the adequacy of the funding. We have done the first round of financing and thus far, I would say we seem to be in pretty good shape.

Mr. CASSIDY. How much? I am sorry. How much total has so far been allocated?

Mr. TONSAGER. I am sorry. Here, go ahead.

Mr. ATKINSON. So far, the allocation has been—first apportionment from OMB has been $25 million and we now have another apportionment request of $500 million that is pending.

Mr. CASSIDY. Now, the $500 million, any idea about the prospects for that being afforded at that level?

Mr. ATKINSON. We are very hopeful.

Mr. CASSIDY. Because $25, well that is—I am very hopeful for a nice Christmas but I am not quite sure it is going to happen. In all seriousness, you are hopeful. Does that mean optimistic?

Mr. ATKINSON. Optimistic.

Mr. CASSIDY. Okay, thank you. The other thing I am not quite sure, as I am reading about the Collection Harvest Storage Transportation Program, are title I crops eligible for this?

Mr. ATKINSON. No.

Mr. CASSIDY. Now, it seems a little counterintuitive because it seems as if you are already aggregating the material from rice, for example, or from sugarcane, it seems like it is a natural place instead of asking the cane farmer to burn it that you would extend this assistance to them. In a sense it is meeting two priorities. Does that make sense?

Mr. ATKINSON. It does make sense. Residues would be an eligible material.

Mr. CASSIDY. It would be eligible?

Mr. ATKINSON. The residues would be.

Mr. CASSIDY. So the rice grain itself would not be but the stalk would be?

Mr. ATKINSON. That is correct.

Mr. CASSIDY. Got you. Now, energy cane, if that ever comes about, that I presume would be entirely eligible?

Mr. ATKINSON. It would be.

Mr. CASSIDY. Okay, thank you.

I yield back.

The CHAIRMAN. The chair thanks the gentleman and recognizes the gentleman from North Carolina.

Mr. KISSELL. Well, thank you, Mr. Chairman.

And, Mr. Tonsager, it is good to have you here and see you again and, Dr. Shah, we appreciate you coming also.

Mr. Tonsager, beyond the credit issues and we have talked about this a little bit back and forth, what are the biggest challenges that we face in seeing the second and third generations of biomass energy being accepted?

Mr. TONSAGER. I think the technical challenges are probably the largest challenges at this point, because the bottom line is the economics of it. We have to be able to produce an energy product that is sellable, that is available readily. To do that, to make the economics work, we really have to overcome some of the challenges associated with breaking material down and making it in an effective, efficient way. So I would have to ask Raj if he would care to comment on that but to me, overcoming those technical challenges will lead us to greater confidence in our ability to produce an energy product that we can make some money out of.

Mr. KISSELL. Well, that was going to be my next question so, Dr. Shah, you talked about how we need to get to the third generation of biomass energy and the numbers I have picked up now, ethanol is like seven percent of our fuel energy at 9 billion gallons a year. In looking towards this third generation, I guess the basic question is: when will this be happening or what will it be? What do we need to do to get there?

Dr. SHAH. Well, thank you for the question. I think the answer to when would this be happening is highly dependent on our ability to invest in and develop together, with the private sector, the right technological breakthroughs to bring the cost down at different points of the value chain which I will mention. But we are optimistic that in a 5 to 7 year time horizon, you will see significant improvements in the economics of second-generation and perhaps a few years after that, significant improvements in the economics of third-generation systems.

On the question of what are the key barriers, I would agree with Dallas' comment that certainly that conversion technology and the amount of the initial capital cost related to those conversion systems is quite high. As we make progress against enzymatic pathways and others to improve the efficiency of that conversion process, we can bring that cost down, both for very large scale systems and for smaller scale conversion facilities. So that is an important

barrier, as you think about it, but that is an important short-term barrier. If you think about the long-term system, probably ½ to ⅔ of the total cost of production will be based on the feedstock.

So our ability to generate large volumes of appropriate feedstocks in an environmentally sound way and economically viable way will be critical to standing up this industry over a 10, 20, 30 year period and meeting the big targets that have been set out there. To do that, we probably need to leverage all of the science we can on the genomic side. We need to invest in significant adaptive research to test and develop new dedicated feedstocks in a broad range of agro-ecologies, and we need to work with the private sector so we can develop feedstocks that fit into their supply chains.

They can provide the types of unique contracting back to farmers and producers so that people have the economic strength to convert or to engage in these new production opportunities and these new opportunities to gain wealth. So, we have quite a lot to do on the feedstock side as well, and that is an area where we have a long and proud tradition—as the Chairman of the full Committee mentioned—in helping to support a system that has very significant yield improvements and production improvements year on year. But we are not there yet in the dedicated feedstocks that would be required for this and that would be a big area of focus for our research portfolio.

Mr. KISSELL. One last question, Dr. Shah, if we are at seven percent now and I know that this is a tough number to give exactly but if we are at seven percent now, where do you think percentage-wise of our total fuel demands that we could get to some 15 years down the road if we do engage in the type of activities both within government and private industry that you were talking about?

Dr. SHAH. Well, I am thrilled that you asked that question because I think that answer is highly conditioned on our ability to make third-generation systems work. And the reason I say that is the likelihood that we can invest and create—in the hundreds of billions of dollars—to create an entire domestic infrastructure for transport fields around ethanol compared to the economic opportunity to leverage the existing infrastructure for advanced fuels. This gives a high degree of confidence that third-generation systems could in fact break through and become very high percentages of total aggregate fuel. I don't actually have the numbers but we can actually model that out, and I can get back to you in a letter that has the answer to that.

Mr. KISSELL. I would appreciate that and thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. The chair thanks the gentleman and recognizes the gentleman from Pennsylvania.

Mr. THOMPSON. Well, good morning.

Let us start out with Mr. Tonsager. You made it clear that biofuels will play an important role in diversifying and expanding our domestic energy supplies. I am a strong advocate of converting wood waste into woody biomass, and in my district timber harvesting generates a significant number of jobs and helps create that woody biomass. It needs to be pointed out that the increased timber harvesting is a key component to proper forest management and probably a properly managed forest becomes a stronger carbon

sink. Now, specifically what role will timber harvesting play in the Administration's plans to utilize more biofuels?

Mr. TONSAGER. I think we must look at every potential biofuel, and certainly woody biomass makes a lot of sense. From my perspective what I would like to see occurring is for us to engage from the economic side, to constantly press forward with feasibility studies, business plans, and focus specifically on particular projects. As the technologies evolve that allow us to break down woody biomass or other biomass products, we need to be looking at the best opportunities for making that economically successful.

So from my side of it what I would love to see happen is groups form or companies form up that are queuing up, looking constantly at the components of a particular project site and looking for the economic opportunities associated with that so we fund and give confidence to people who invest in those areas. So I want to look at all forms, and I want to look at them as widely as possible, going forward, and seeking that economic opportunity. Sometimes you really hit the right chord in the right spot and you might have the technology that really works, and so we would love to be working with the people in Pennsylvania and other places to evolve a plan towards project development.

Mr. THOMPSON. Well, that would be great. I know that in Pennsylvania, as well as across the nation, where these forests are and specifically national forests, there is a lot of economic need. I know in terms of harvest in the Allegheny National Forest there is a need, it is down from 95 million board feed a year. I think we are down to about 20, so the production utilization there is just a lot of potential there from all my sides.

Now, relating to that, are you familiar with the alternative mixture tax credit?

Mr. TONSAGER. I am sorry, I am not.

Mr. THOMPSON. Okay, it is paper mills and companies that have been able to claim this credit for utilizing what is called black liquor. It is a byproduct of the pulping process as a form of onsite energy. However, the credit for this is set to expire this year and some in Washington have been hesitant to reauthorize it. I think presumably because paper companies can claim this credit, and I would like to and if you don't know, if this is something if you could get back to me. Is the Administration supportive of reauthorizing the mixture credit as it exists?

Mr. TONSAGER. Okay, we will.

Mr. THOMPSON. I appreciate that.

Dr. Shah, you have stated that we must improve upon the genetics of the feedstocks grown and the production practices we use to not only produce more but to enhance production. Is the Administration intending to encourage this kind of innovation solely through grants, or are there any new methods of encouragement being considered?

Dr. SHAH. Thank you for that question and if I might just add to Dallas' answer to the prior one that we have done some estimates around how different sources of biomass could contribute to the broader targets. We believe you can get about 9.1 billion gallons out of woody biomass if we make the right technology invest-

ments, and so we are moving forward against that strategic framework which is a pretty significant amount of fuel from that.

Mr. THOMPSON. Very good.

Dr. SHAH. And on the grants question, that is a great question. We do a lot of distributed grant-making as it currently stands, and I think the two opportunities we have are: number one, to engage in a more strategic consortia-based programmatic approach so that if we are trying to introduce and develop, say dedicated feedstocks like energy cane, we might invite some private sector firms in. We might work with a number of different potential representatives of different agro-ecologies and geographies and universities, and say, "Okay, what is the best way to expand on germplasm collections," test and develop new varieties in a number of different contexts and leverage some of the great innovation that is happening right now in the private sector. So that is one approach where we would like to go beyond the traditional grant tool and build these kind of public-private consortia. A second thing that we would like to think about is how can you use large-scale financial incentives from long-term buyers of advanced biofuels to create a huge amount of market pull so that the private sector will simply do more. We have had conversations with major airlines, with the Air Force and with others. This is a model that has been used in other industries of course, but if you could get a guaranteed purchase contract for very large amounts of advanced biofuel that would, and it had a lot of credibility as to your point, that would stimulate a significant amount of private investment and it wouldn't cost us in the public sector nearly as much. So we are actively looking at can we put those kinds of financial market incentives in place to create this whole new sector.

Mr. THOMPSON. Okay, very good.

Thank you, Mr. Chairman.

The CHAIRMAN. The chair thanks the gentleman and recognizes the gentleman from New York, Mr. Murphy. The gentleman passes. I will recognize the gentleman from Colorado. He is not here either, okay, the gentlewoman from Illinois.

Mrs. HALVORSON. Thank you, Mr. Chairman.

Mr. Atkinson, if we are going to and thanks to the panel. It is great to see all of you.

If we are going to hit our target of 36 billion gallons of biofuels by 2022, we have to meet that. How are we going to? We need to change the way we do business. Does that mean we are going to have to change some of our Federal policies? If so, which ones and how would you go about doing that?

Mr. ATKINSON. I don't believe we would need to change any Federal policies in any sort of a radical sense. The biggest challenge, I believe, in the early years of the renewable fuel standard is meeting the production targets for advanced biofuels. We know right now, and those of us involved in this issue, we hear quite often that the technology is just 1 year away or it is just around the corner. We might want to take a look at policies that can help push that forward a little bit further so that we actually have the construction and movement forward on commercialized advanced biofuel facilities.

Mrs. HALVORSON. So you think we will be okay? We will meet 36 billion gallons of biofuels by 2022?

Mr. ATKINSON. By 2022, yes, I think we absolutely have the technology to move forward on that and to meet that goal.

Mrs. HALVORSON. Dr. Shah.

Dr. SHAH. If I might just expand on that, I am optimistic that we can get there. I don't believe we are currently on the appropriate technology and systems pathway to get there.

Mrs. HALVORSON. And what would you do to change that?

Dr. SHAH. I think the two biggest gaps for us are focusing public incentives and research investments in those areas where we can bring to bear a significant second and third-generation biofuel system. For us that means feedstock conversion and byproducts. We need the Department of Energy to do a lot more in a more effective and focused way on conversion, and we need to do a lot more in a more focused and effective way on feedstock and byproducts. I also think we need to think about some of the investment, some of the financial incentives we were just talking about to create the kind of large scale market incentive for commercialization. Secretary Vilsack has asked us to, on behalf of the President's task force on which he is a part, think more expansively about what kind of policy framework and what kind of program implementation framework would get us to those targets. So I would agree with the fact that I am very optimistic we can get there and respect our Secretary's leadership in bringing us all together to say what needs to happen in order to hit that target, and we are actively working on that.

Mrs. HALVORSON. So it is in your notes to take back that you are going to do something about that.

Dr. SHAH. We are, yes.

Mrs. HALVORSON. The reason I bring this up is I don't want you in the year 2020 to come back and say well we are nowhere near our goal. We have to do something now. That is not the time to start worrying about it.

Dr. SHAH. I agree and Secretary Vilsack has made that quite clear to all of us and we are working together to help support that.

Mrs. HALVORSON. Some people may not think they will be around in 2020. I plan on being here and I don't want to come back and say I didn't talk about it in 2009.

Dr. SHAH. Wonderful.

Mrs. HALVORSON. Okay and one other question for Mr. Tonsager, the President's energy bill you said it was very important to offer the acceleration of the advanced biofuels. What kind of concerns do you have if it doesn't go anywhere? How difficult would it be to advance your ideas and the biofuels industry if we don't get an energy bill passed or a climate change bill passed?

Mr. TONSAGER. I tend to look at it from a financial perspective, of course, and for those engaged in development of these kinds of ventures, they are going to look for clearness, for definition, for consistency. So as much as wanting to know what the answer is, they want an answer. So, laying the pathway, knowing what the pathway is, bringing stability to one component of what we have to deal with is very important.

Mrs. HALVORSON. And the people in my district, and being in Illinois I have quite a few located and headquartered there, the people tell me they want certainty. They just want to know one way or another, and we owe it to them. One way or another, we must bring certainty to this market. So I think that we need to all work together to bring that certainty, so I look forward to working with you to get that done.

Thank you, Mr. Chairman, I yield back.

The CHAIRMAN. The chair thanks the gentlewoman and recognizes the gentleman from Kansas.

Mr. MORAN. Mr. Chairman, thank you. Thank you to you and Mr. Goodlatte for hosting this hearing and for our witnesses on this panel and the next for being with us today.

Dr. Shah and I had a conversation, largely on my part at the last hearing, and it is Mr. Tonsager that I really did need to address my question. Section 9005 of the farm bill, Bioenergy Program for Advanced Biofuels, section A, says the definition of an *eligible producer:* "In this section, the term eligible producer means a producer of advanced fuels." And yet, USDA in June published a notice of contract proposal for payments to eligible advanced biofuel producers that said that any recipient corporation must be at least 51 percent owned by persons who are citizens or nationals of the United States. Nowhere in the farm bill is that requirement outlined. USDA's rule disqualifies a legitimate biofuels producer located in the United States, and in this case in Kansas.

While I am not necessarily here to advocate for a particular company, Abengoa is operating an ethanol plant in our state and it qualifies for advanced biofuels because it uses grain sorghum to produce that ethanol, but because of your definition they would be ineligible. Perhaps even more importantly, Abengoa is soon expected to be the first producer of cellulosic ethanol in the United States. The plant is being constructed, and, yet, under your definition they would not be eligible as an advanced biofuels producer. In my way of thinking, this is Kansas jobs, Kansas grain, Kansas ethanol. My question is the same one that I asked Dr. Shah at the last hearing, USDA have a theory for which they reached this conclusion, this definition? What can we do to get it changed so that Kansas crops, Kansas jobs and the Kansas economy is not harmed by this regulation, this definition?

Mr. TONSAGER. Sure. While we are reflecting on this, I note that this has come up in recent times, I was a state director in the 1990s. It was kind of the standard for most of our programs at that time to have the 51 percent ownership by U.S. citizens. And the question comes up is, "Okay, are we going to throw the definition out entirely? Or drop it to 49, or drop it to 25, or just drop it all together as a requirement?" I think it is important that we find out from the public their view on this subject. So as we go about rulemaking during this coming year we will be requesting input from the public regarding their views on this subject. We will be working towards a final rule on the program. In our notification we will be requesting the public to offer us comments about whether they think that is an important factor anymore or not.

Mr. MORAN. Mr. Tonsager, as I understand your answer, it is that is the way we have done it in the past. That is our plan at

the moment for the future, but we are reassessing or we are taking input to see whether we should reassess?

Mr. TONSAGER. We are going to take input. We will be looking at the responses from the public very closely on the matter. Again, I think it is a question of what is the right point, or is there one at all anymore? I think it is useful for all of us to explore that question and understand how the public might view it.

Mr. MORAN. Well, it does seem to me that in this case it is a subsidiary that is in Kansas and is owned 100 percent by a Spanish company, but the benefits accrue to people of the United States.

Mr. TONSAGER. Sure.

Mr. MORAN. In large part, almost exclusively it is. They are the ones who are developing the technology, the new science. We are the beneficiaries of that and, particularly, as a Kansan, tremendous opportunities. We, USDA was there when we announced the arrival of Abengoa. You were there when we broke ground. This is a great development for agriculture and for the biofuels industry and it is something we ought to be applauding, in my opinion, as compared to hindering. Is there specific statutory authority to write the rule the way you wrote it?

Mr. TONSAGER. No, it is not. It was regulatory.

Mr. MORAN. And it is, I guess, then possible that this decision will be determined as you write the rules for this program?

Mr. TONSAGER. Yes, we are publishing it as it is or we will be. We are developing that, of course, at this point, but we will be seeking public comment and will consider comments and look for the perspectives from the public on that matter.

Mr. MORAN. Thank you very much. Thank you for Dr. Shah letting me have this conversation with him a month or so ago.

Dr. SHAH. Thank you.

Mr. MORAN. And, Mr. Tonsager, you are a very important person to me. What happens at Rural Development at USDA matters a lot in Kansas. We have had a great working relationship with your predecessor and previous Administrations as well, and we welcome you to your job and look forward to developing that close working relationship with you. We appreciate your commitment to rural America.

Mr. TONSAGER. And I am very happy. I appreciate that very much and very much look forward to it as well, sir.

Mr. MORAN. Thank you, sir.

Thank you, Mr. Chairman.

The CHAIRMAN. The chair thanks the gentleman and recognizes the gentleman from California.

Mr. COSTA. Thank you very much, Mr. Chairman, for this hearing. It is timely as we look at trying to reset a comprehensive energy policy in this country, and the role that biofuels will play in the second and third generation.

I want to touch on some of the areas that some of the Members spoke on earlier, but what I don't think we have covered here yet, at least since I have been here, is the role that methane digesters play as a part of this overall effort on renewable fuels where agriculture has potential. We have had a number of pilot projects that you may be aware of in California. The dairy industry is a significant part of our ag economy and some 1,600 dairies, many of them

large dairies have the capability of producing significant fuel for their use and to sell. You may be aware that in California, and maybe in other parts of the country, we have run into a host of barriers that put strict limits on emissions without taking into account the benefit of these digesters. Is there some way to get a positive net reduction of what is considered the GHGs in the mix as we move to the next generation of fuel, so that we don't have to repeat the situation of digesters being turned off because of local NO_X issues, especially when you have air basins where you have non-attainment and there are sanctions by either the Federal EPA or by state laws?

Dr. SHAH. I don't have a very specific answer to the digesters question specifically, but I can look into that and send some thoughts via letter as follow up. I do believe that as we talk about second and third generation fuel systems and, especially, dedicated feedstocks and tools that will enable the use of those feedstocks to be more efficient.

Mr. COSTA. Has USDA looked at what the potential is of these digesters?

Mr. TONSAGER. Yes, I was fortunate to be in Sacramento some months ago and spoke to the biomethane conference that occurred there. I am very familiar with the issues associated with it.

Mr. COSTA. What do you believe is the potential?

Mr. TONSAGER. Yes, absolutely.

Mr. COSTA. No, I said what do you believe? I mean do you have a comparative? Do you have a scale of the potential?

Mr. TONSAGER. Of what? I couldn't quantify it right off the bat. My sense is some of the challenges are not challenges but opportunities. Much of it is evolving with rural electric generation as to how we can get that generation from those facilities onto the grid. I think that is an opportunity that we have to work at to make sure that works. I don't have a sense of the scale. I would suggest that there is probably concentration.

Mr. COSTA. Well, let me go because of my time and you can get back to me on the sense of the scale.

Mr. TONSAGER. Sure, okay.

Mr. COSTA. Do you think they are comparable, incentives and programs available to livestock farmers to participate in the next generation of biofuels?

Mr. TONSAGER. Yes, there are opportunities within our programs.

Mr. COSTA. Yes, can you enumerate those?

Mr. TONSAGER. Well, we have a particular program, the REAP Program, the Rural Energy for America Program that is being used today to finance biomethane digesters.

Mr. COSTA. Can you give us a snapshot in terms of the biofuel development on projects that have received funding to the loan guarantee program so far?

Mr. TONSAGER. I can provide you that. I don't have it.

Mr. COSTA. Please do for the Subcommittee. What are the differences between your program under USDA and the Department of Energy under your loan guarantee programs?

Mr. TONSAGER. That is unclear to me, the DOE programs and how they are functioning. I don't think they have moved forward yet.

Mr. COSTA. But isn't there a collaboration supposed to be taking place with Carol Browner between USDA and the Department of Energy and the other appropriate agencies on this whole comprehensive energy effort?

Mr. TONSAGER. Yes, my staff does meet with the DOE and there has been dialogue about the structure of our programs with them, but to this point I don't know that they have established a framework for their program.

Mr. COSTA. Well, I would like to have some light shed for the Members of the Subcommittee on applications that are coming in from one sector to another, and how well you guys are working in this collaborative effort.

Mr. TONSAGER. Okay.

Mr. COSTA. I keep hearing about it but I don't see any examples of it.

Mr. TONSAGER. Okay, I will have to forward that to you.

Mr. COSTA. I hear this thing that you guys are having meetings and that is wonderful that you are having meetings, but we have, in my sense, way too damn many meetings in this town. I would like to see some work product come out of some of these meetings.

Mr. TONSAGER. Okay.

Mr. COSTA. You know, takeaways, you know what I mean?

Mr. TONSAGER. Yes.

Mr. COSTA. And I would like to know what those takeaways are.

My time has expired but I have a couple more questions.

The CHAIRMAN. The votes have been called so if the gentleman doesn't mind, we will proceed with the gentleman from Missouri.

Mr. COSTA. All right, thank you, Mr. Chairman.

Mr. LUETKEMEYER. Thank you, Mr. Chairman.

I have four biodiesel plants in my district, biofuels plants, two ethanol, two biodiesel so this is an extremely important issue to me and my constituents. Mr. Tonsager, you have mentioned in your testimony that you are working very closely with a lot of government agencies. How is your relationship with EPA and what are you guys doing with those folks to minimize the impact of their rulemaking on what we want to do with biofuels?

Mr. TONSAGER. The conversations thus far have occurred between the Secretary's office and the Chief Economist's office with EPA and other parties. I have not personally been engaged in the dialogues with them.

Mr. LUETKEMEYER. What is their view of biofuels in your judgment? Are they going to be somebody that you can work with? Are they going to try and throw roadblocks up to some of the expansion of your programs and some of the research that is going on? Are they going to push for it? Where are we at?

Mr. TONSAGER. You know, the EPA is of course in the process of reviewing their position regarding the blend wall and the combination of percentages. The position I have taken from our agency is that we will aggressively pursue the development of these energy sources whatever the rules are. I have not personally had a dialogue related to the EPA or advocated with them. The Secretary's office and the Chief Economist have had that relationship.

Mr. LUETKEMEYER. Well, I think it is important that we work with those folks because I know that every time they are before our

Committee we can't get an answer out of them. I don't know maybe you can, but I know it is disappointing for us to see them come, at least it is for me personally, from the standpoint that every time I ask them a question I never get an answer. So hopefully you can work with those folks to make sure that they don't impact in a negative way the ability of our farmers to produce the corn, the beans, whatever the product is to be able to be able to utilize these things because this is an important industry. It is something that is going to help down the road and have an incredible impact on our fuel consumption as well as energy usage.

Mr. TONSAGER. Yes.

Mr. LUETKEMEYER. Dr. Shah, in your testimony you indicate research that should invest in technologies, improve economics for producers and consumers alike. In my district, I have the University of Missouri which is one of the leading agriculture research institutions in the country, as well as Monsanto who just sits outside my district which of course does a tremendous amount of research. What is the percentage that we have with regards to a government-funded research *versus* private sector research?

Dr. SHAH. Just can I ask for clarification, is that overall or with respect to second and third generation biofuels?

Mr. LUETKEMEYER. Well, let us take the biofuels industry as a whole.

Dr. SHAH. All right, well, certainly if you look at first generation fuels, the great preponderance of productivity research on corn and soybeans goes in from the private sector and from firms that you mentioned that are located in your district. So one of our goals has been how can we reorganize our research portfolio in a way that leverages the technologies they are developing and is complementary to that, but not trying to replicate or duplicate what they are already doing. They invest in, like Monsanto alone invested around $980 million a year of R&D, and most of that is focused on a few prompts and a few traits. They are able to leverage a germplasm collection and a system for breeding that uses advanced molecular genetics that has germplasm from all over the world very easily available to their scientists.

Mr. LUETKEMEYER. Right, right.

Dr. SHAH. We are trying to emulate that in crop categories that are not corn and soybean so that we can build up the potential for second and third generation fuels where there is still a lot of innovation happening in the private sector, but not nearly at that scale. We believe we can work with the private sector and play a far more significant role to bring to bear some of these dedicated feedstocks.

Mr. LUETKEMEYER. What percentage of your support though is for university-type research *versus* private sector research?

Dr. SHAH. Well, it would depend on which program we reference. For example, in the 9008 Program we had 190 full proposals and we will be making ten awards from that and that is with DOE but at around $25 million. Most of that will be targeted to universities and public research institutions, there are some awards in there for the private sector, I believe it is less than 40 percent. I could be more specific and note that.

Mr. LUETKEMEYER. That is fine. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. The chair thanks the gentleman. There are less than 10 minutes remaining for three votes but we have time to recognize the gentleman from Ohio.

Mr. BOCCIERI. Thank you, Mr. Chairman. I will be very, very brief.

Very quickly I just wanted to pound on my chest for the 16th Congressional District in Ohio. Ohio State Agricultural Research and Development Center is doing much research on this on these topics that we are discussing here today and we appreciate the support from the Department. Real quickly and the Air Force as well, Dr. Shah, had mentioned that the Air Force is beginning to test this. Wright-Patterson Air Force Base is already beginning to test the use of biofuels and blended fuels, *et cetera*, on aircraft, flying aircraft. I would like to highlight you to that research that we are doing in Ohio. It is my opinion that farmers have yet remained very skeptical about the investments in the alternative energies, and judging from their tepid response on the energy bill that passed the House, I want to know what measures you are taking at Agriculture and Department of Energy to do this outreach, if you could quickly respond.

Mr. TONSAGER. We do have a plan that we are evolving on the process of outreaching to producers on the projects involved. We have been talking as we speak around the country and aggressively advocating for biofuels. We understand that there is a mixed view in some cases regarding biofuels. I think what needs to be done is to focus on the needs of particular areas and the economies of particular areas and the availability of resources because the bottom line is, people are going to look for economic opportunity. So, as we identify those economic opportunities, we will advocate in the areas where it might be possible to put together projects.

Mr. BOCCIERI. Thank you it is my opinion that the only thing that is preventing our country from producing robust alternative fuels and alternative energy is the energy that we invest in it. I believe that with these type of grants that you are awarding and the research that we are doing we can make a difference.

Last question real quickly, tell me if you are getting resistance or help working intra-agency between the Department of Energy and Agriculture. Are you working in tandem, hand-to-hand to bring this because I have heard different stories and I want to hear it from you.

Dr. SHAH. You know, up to this point there have been a large number of committees and meetings and organizing groups that do that at different levels. This Administration has been committed to a stronger partnership at the Cabinet level and so it is Secretary Vilsack and Secretary Chu and Administrator Jackson all co-chairing this biofuel task force. We are finding that it is far more productive to have conversations. We are having real discussions about how to bring each agency's and each organization's core competencies to the program, and we are having real conversations about how to reduce the duplication that sometimes exist across those agencies. Everybody is very focused on the very specific quantitative goals established by Congress for 36 billion gallons and even larger ones farther out established by the President during the campaign, so I think it is improving significantly.

Mr. BOCCIERI. It is my opinion that this will not work without a vibrant and good partnership that is fostered between the two agencies, so I hope that to that end that you will work together.

Thank you, Mr. Chairman, I yield back.

The CHAIRMAN. The chair thanks the gentleman and recognizes the gentleman from Idaho.

Mr. MINNICK. My state has substantial resources in both traditional agriculture and forest products for biofuels of almost all types. As I talk to the producers and potential producers, the problem is not that the technology doesn't exist, or can't be developed with reasonable surety, or that they can't find funding. The main problem is that most of these technologies are very economic when the price of gasoline is $5 but if it falls to $3 or $2, they are out of luck and bankrupt. If we are really serious about jump-starting some of these technologies, it seems to me that we need a guaranteed program that would be limited in time, that would be keyed to the price of alternative fuels for the period of time necessary to recover the capital invested in these capital-intensive projects. Do you have underway or do you contemplate a program that would provide, essentially, a price protection against alternative fuels for these producers who make a capital investment for the period of time required to recoup that investment in the event that prices decline and leave these fuels temporarily noncompetitive?

Mr. TONSAGER. I agree completely with you on the idea of the instability creating problems for us. I think the significant movements in the all, in several market areas have created some of the great uncertainty we are faced with investment at that time. I am more than happy to explore options that you might want to talk about that might alleviate the stress of starting up a project. I think we have to look for every opportunity. I have not contemplated that particular kind of an approach yet, but I do spend a lot of time thinking about how we try to create certainty, stability and circumstances where investors and creditors would be willing to step up and take risks.

Mr. MINNICK. I would like to urge you to contemplate that kind of program.

Mr. TONSAGER. Okay.

Mr. MINNICK. Because without it we can do a lot of talking and have a lot of committee meetings, but we are not going to attract the significant private capital required to commercialize that scale these kinds of projects needed to meet the ambitious goals that you speak about and spoke about earlier. I would be happy to work with you on that effort. Thank you very much.

Mr. TONSAGER. Thank you.

The CHAIRMAN. The chair thanks the gentleman. The chair thanks the witnesses for their testimony today, and the Subcommittee will be in recess until the three votes are cast and then we will have panel two. Thank you.

[Recess.]

The CHAIRMAN. The Subcommittee will come back to order.

We would now like to welcome our second panel. Ms. Mary Rosenthal, Executive Director of Algal Biomass Association, Preston, Minnesota; Ms. Susan Ellerbusch, President, BP Biofuels North America, Warrenville, Illinois; Mr. William J. Roe, President

and CEO of Coskata, Incorporated, Warrenville, Illinois; Mr. Bruce Jamerson, Chairman of the Board of Directors of Mascoma Corporation, Lebanon, New Hampshire; and Mr. Craig Shealy, President and CEO of Osage Bio Energy, Glen Allen, Virginia.

Ms. Rosenthal, you may begin when you are ready.

STATEMENT OF MARY ROSENTHAL, EXECUTIVE DIRECTOR, ALGAL BIOMASS ORGANIZATION, PRESTON, MN

Ms. ROSENTHAL. Good morning and thank you for allowing us the privilege to testify here in front of this Subcommittee on Conservation, Credit, Energy, and Research.

My name is Mary Rosenthal. I am the Executive Director of the Algal Biomass Organization.

The Algal Biomass Organization represents stakeholders involved in the use of algae biomass for the production of next generation biofuels. The ABO, as an industry trade association, is focused on facilitating the commercialization and market development of algal biomass to produce fuels that have significantly reduced carbon emissions compared with petroleum-based fuels while beneficially reusing carbon dioxide from industrial and atmospheric sources. Algae are a sustainable, renewable feedstock that will help America become energy independent and make our nation significantly reduce its carbon footprint.

Third generation algae-based fuels are different from first and second generation fuels. Unlike first and second generation biofuels algae-based fuels are easily refined into hydrocarbons including gas, diesel and jet fuel and thus serves as a direct fossil fuel replacement. Algae-based fuels are also compatible with existing oil and pipeline infrastructure and engines. Additionally, algae-based fuels are competitive with other biofuels which can be blended with algae-based hydrocarbon fuels making algae-based fuels a compatible, not competitive, technology.

Right now, algae-based fuels are being successfully produced and tested today. Production timelines for the industry range from the near, 1 to 2 years, to the midterm, 5 to 8 years proving that algae-based fuels industry is ready to commercialize. So the question is why algae and why now? Algae holds tremendous potential to play a key role in the development of a new energy economy, one driven by environmentally and economically sustainable fuel and power generation. Any commercially viable energy feedstock must be able to scale to meet national and to global energy needs. Algae are one of the nation's most photosynthetic organisms meaning that algae do not waste time doing anything but producing oil and growing. A single crop of algae can mature in as little as 7 days making algae one of the fastest growing and most scalable energy feedstocks available.

Algae are enormous consumers of CO_2, consequently algae require abundant atmospheric industrial source CO_2 in order to scale to significant levels. Algae beneficially reuses CO_2 by turning it into fuels and other important commodities thus strengthening our green economy while increasing America's energy security. Algae can be grown on non-arable desert land using non-potable water or brackish water, consequently, algae preserves precious agricultural

resources while providing exciting new opportunities for rural development.

Algae fuels range from ethanol to biodiesel to drop-in transportation fuel such as jet, diesel and gasoline, and thus can help the rest of the biofuel community meet our renewable fuel mandates. Significant process has been made to the commercialization of algae among companies, scientists and broader interests. Interest in algae as a resource continues to grow, and technological advances in the production of algae biomass combined with hundreds of millions of dollars invested just this year in research and production, and brought the industry much closer to commercialization and cost efficient production.

Unfortunately, there many of the Federal Government's existing policies that exempt algae from benefits similar to those enjoyed by other biofuels. These include financial parity. Algae should receive the same tax incentives, subsidies and other benefits that other renewable fuels, particularly cellulosic biofuels receive. RFS parity, algae is currently excluded from the majority of the renewable fuel standard due to the 16 VAT gallon carve out for cellulosic biofuels. This carve out should be changed. Finally, beneficial CO_2 reuse recognition: Algae's unique ability to turn CO_2 into renewable fuels will allow the organism to play a significant role in abating carbon emitted by industrial sources. Consequently, algae's beneficial reuse of CO_2 should be acknowledged and counted for in carbon capture and sequestration legislation. Algae fuels will play a significant near-term role in helping our nation meet its goals in transitioning to sustainable renewable fuels, improving our green economy and increasing our nation's energy independence.

[The prepared statement of Ms. Rosenthal follows:]

PREPARED STATEMENT OF MARY ROSENTHAL, EXECUTIVE DIRECTOR, ALGAL BIOMASS ORGANIZATION, PRESTON, MN

The Algal Biomass Organization represents stakeholders involved in the use of algal biomass for the production of next generation biofuels. The Algal Biomass Organization, as an industry trade association, is focused on facilitating the commercialization and market development of algal biomass, to produce fuels that have significantly reduced carbon emissions, compared with petroleum-based fuels, while beneficially reusing carbon dioxide from industrial and atmospheric sources. Algae are a sustainable, renewable feedstock that will help America become energy independent, and help our nation significantly reduce its carbon footprint.

"Third generation" algae-based fuels are different from first and second-generation fuels. Unlike first and second-generation biofuels, algae-based fuels are easily refined into hydrocarbons—including gas, diesel and jet fuel—and thus serve as a direct fossil fuel replacement. Algae-based fuels are also compatible with existing oil and pipeline infrastructure and engines. Additionally, algae-based fuels are not competitive with other biofuels, which can be blended with algae-based hydrocarbon fuels, making algae-based fuel a compatible, not competitive, technology.

Algae-based fuels are being successfully produced and tested today. Production timelines for the industry range from near- (1–2 years) to mid-term (5–8 years), proving that the algae-based fuel industry is ready to commercialize.

Why algae and why now?

Algae hold tremendous potential to play a key role in the development of a new energy economy—one driven by environmentally and economically sustainable fuel and power generation.

- Any commercially viable energy feedstock must be able to scale to meet national—and eventually global—energy needs. Algae are one of nature's most efficient photosynthetic organisms, meaning that algae do not waste time doing anything but producing oil and growing. A single crop of algae can mature in

as little as 7 days, making algae one of the fastest growing and most scalable energy feedstocks available.

- Algae are enormous consumers of CO_2. Consequently, algae require abundant atmospheric and industrial-source CO_2 in order to scale to significant levels. Algae beneficially reuse CO_2 by turning it into fuels and other important commodities, thus strengthening our green economy while increasing America's energy security.
- Algae can be grown on non-arable desert land, using non-potable salt or brackish water. Consequently, algae conserve precious agricultural resources, while providing exciting new opportunities for rural development. Algae can be grown using non-food energy sources such as cellulosic material and waste chemicals. These methods of cultivating algae can provide a new agricultural crop without large scale change in land use or imposing unsustainable demands on potable water supplies.
- Algae-based fuels range from ethanol to biodiesel to drop-in transportation fuel, such as jet, diesel and gasoline, and can thus help the rest of the biofuel community meet our nation's renewable biofuel mandates. Some companies in the industry have produced and tested these drop-in fuels already.

Significant progress has been made toward the commercialization of algae-based renewable fuels and their resultant co-products. Among companies, scientists, and the broader public, interest in algae as a resource for renewable energy continues to grow—and technological advances in the production of algal biomass combined with hundreds of millions of dollars invested this year in research and production have brought the industry much closer to commercialization and cost-efficient production of algal biomass.

Unfortunately, many of the federal government's existing policies exempt algae from receiving benefits similar to those enjoyed by other biofuels. Such oversight can be easily remedied if the government takes the following actions:

1. **Financial parity—**Algae should receive the same tax incentives, subsidies and other financial benefits that other renewable fuels, particularly cellulosic biofuels, receive.

2. **RFS parity—**Algae is currently excluded from the majority of the Renewable Fuel Standard, due to a 16 billion gallon carve out for cellulosic biofuels. The carve out should be changed so that it is technology neutral, thus allowing algae-based and other environmentally sustainable fuels to contribute to our nation's efforts to become energy independent.

3. Beneficial CO_2 reuse recognition—Algae's unique ability to turn CO_2 into renewable fuels will allow the organism to play a significant role in abating carbon emitted by industrial sources. Consequently, algae's beneficial reuse of CO_2 should be acknowledged and accounted for in carbon capture and sequestration legislation.

Algae-based fuels will play a significant, near-term role in helping our nation meet its goals of transitioning to sustainable renewable fuels, improving our green economy, and increasing our nation's energy independence.

The CHAIRMAN. Thank you.

Ms. Ellerbusch.

STATEMENT OF SUSAN ELLERBUSCH, PRESIDENT, BP BIOFUELS NORTH AMERICA LLC, WARRENVILLE, IL

Ms. ELLERBUSCH. Good afternoon.

My name is Susan Ellerbusch and I am the President of BP Biofuels North America. I am one of 29,000 employees of BP working in the United States. I want to thank the Chairman, Ranking Member and all other Members of this Subcommittee for the opportunity to present BP's views on the opportunities and challenges facing us in the advanced biofuels industry.

BP believes there must be an all of the above energy strategy in the U.S. This strategy will allow us, as a country, to explore for and develop a diverse array of new domestic energy sources that are secure and reliable. BP is committed to its alternative busi-

nesses and holds them as an integral part of our BP group. Our alternative energy business is on track to deliver $8 billion in investments over 10 years. In the biofuels business alone, BP has committed more than $1.5 billion on research, development and production. BP believes that advanced biofuels will play a material role in the U.S. energy future. BP will not only purchase biofuels but we will produce them in the U.S. BP has made a strategic choice to pursue advanced biofuels because it appreciates the opportunity to invest in a new and high-growth industry. We also recognize our ability to leverage our capabilities and insights into the energy markets logistics, projects, and operational management.

BP does have a focused biofuel strategy. First, we intend to produce cellulosic biofuels in the U.S. from dedicated energy crops. Second, we have established an Advanced Biofuel Molecule Program and last, we have begun production of ethanol in Brazil using sugarcane as a feedstock.

The U.S. business model is built on several key strategic beliefs. First, that a new value chain within the U.S. must be created to enable the growth of advanced biofuels and second, that advanced biofuels will be cost and performance competitive with incumbent products by 2022. Last, that transitional incentives and support structures need to be in place to allow this industry to develop.

In developing a U.S. cellulosic business BP has made two critical choices. First, we have chosen to utilize dedicated energy crops, and second, we have chosen to deploy a biochemical conversion process for our production. Both choices are difficult routes in the short term but are likely to be optimal paths in the long run.

To date, BP has invested $90 million in a technology partnership with Verenium Corporation, a leading advanced biofuels player. This partnership is advancing Verenium's original cellulosic technology and supports advancements of Verenium's 1.4 million gallon a year proof of concept demonstration facility that is currently up and running in Jennings, Louisiana. Also, with Verenium, BP has built the first, is planning to build the first U.S. commercial scale cellulosic facility in Highlands County, Florida. This joint venture which we have named Vercipia Biofuels combines BP's project design and engineering expertise with Verenium's biotechnology expertise. We intend to complete construction of a 36 million gallon a year facility by 2012. This plan also includes adding additional capacity. The joint venture will look at a second possible site in the U.S. Gulf Coast and going forward, BP hopes to progress other cellulosic facilities of this nature in the U.S.

In the area of advanced molecules, BP has focused on biobutanol. Biobutanol is an advanced molecule that can be produced from the same feedstocks as ethanol through modest retrofits to existing facilities. This advanced molecule offers benefits such as higher energy content and the ability to blend at higher rates, while still using an industry's existing distribution infrastructure. We have created a joint venture with DuPont called Butamax for the development and commercialization of this better biofuel molecule. We are currently building a demonstration facility for the technology in the UK, and hope to be able to commercially deploy the technology here in the U.S. in the 2012 to 2013 time-frame.

However, our path of development in advanced biofuels is not an easy one. There are a number of critical supply side challenges facing the advanced biofuels industry that were not necessarily present for the current generation of biofuels. First, a value chain for cellulosic biofuel feedstock supply must be developed. The value chain for dedicated energy crops, forest waste, and agricultural residue is simply not ready for scale and to meet the requirements by the government mandates. Second, there remains technology challenges related to the scale and cost competitiveness of the technologies available today. These conversion technologies have not been proven at commercial scale. Last, we lack the access to financing in the present industry due to the current situation in the financing industry. The current financial crises have prevented venture capitalists and bankers from investing in many worthwhile investments. On the demand side it is worth noting that there does exist a significant challenge to the blend wall that is the markets ability to absorb these ever-increasing volumes of biofuels. BP believes that a combination of time, technology development, and policy support and infrastructure investment will solve this problem. We believe that advanced molecules like biobutanol can lessen the effect of the blend wall in the marketplace.

However, while these challenges are significant, they are not insurmountable. A stable industry with multiple technologies and multiple forms of partnership will best enable stability in the long run. Government support structures: The industry and investors must see a secure market. Transitional support mechanisms managed well by critical government agencies such as the USDA and DOE will also ensure continued development in the industry.

In closing, BP appreciates the pursuit of solutions to energy security, economic and environmental challenges faced by the U.S. BP wants to be part of the solution. Biofuels done well can play a key role in delivering these major policy goals. Thank you.

[The prepared statement of Ms. Ellerbusch follows:]

PREPARED STATEMENT OF SUSAN ELLERBUSCH, PRESIDENT, BP BIOFUELS NORTH AMERICA LLC, WARRENVILLE, IL

My name is Susan Ellerbusch, and I am the President of BP Biofuels North America LLC.

BP appreciates the opportunity to appear before this Committee and present our views on the opportunities and challenges in the advanced biofuels industry. The needs of our country require that we explore for and develop a diverse set of new domestic sources of energy that are secure and reliable in good times and in tough times. We believe advanced biofuels will play a material role in the U.S. energy future.

BP Overview

I am one of the 29,000 employees at BP working in the United States. We are not only the largest oil and gas producer in the United States, but also the company that invests in the most diverse energy portfolio in the industry. Over the last 5 years, we have invested approximately $35 billion in the U.S. to increase existing energy sources, extend energy supplies and develop new low-carbon technologies.

BP's investments stretch from the Gulf of Mexico to the North Slope of Alaska and from the East Coast to the Midwest and the West Coast. Our 11,700 service stations—most of them locally owned and operated—are a familiar part of the American landscape.

BP is 100 years old this year—a history that began with striking oil in the Persian desert after 6 years of toil and has continued through wars, oil shocks, globalization and growing environmental awareness. The company's major spending programs touch every major segment of the energy industry, from exploration and

production of oil and natural gas through refining and distribution of fuel products, as well as renewables. Persistence and innovation have been two of the company's hallmarks, along with an ability to anticipate and adapt to external trends, whether political, social, economic or environmental.

BP Alternative Energy

We've recognized the changing nature of the world's energy needs. As an energy supplier we are faced with the need to meet consumers' growing consumption demands and at the same time ensure secure sources of energy that offer solutions to climate change.

So it is not surprising that BP has been an early mover in the low-carbon world, setting up a solar business over 30 years ago and leading the oil and gas industry in acknowledging the risks of climate change and urging precautionary action.

Today, BP's alternative energy businesses are integral to the BP Group. Our alternative energy businesses aim to be commercially, as well as environmentally, sustainable. Launched in 2005, BP Alternative Energy is on track to achieve its objective to invest $8 billion over 10 years on renewable and alternative energy. In the biofuels space alone, BP has committed more than $1.5 billion to biofuels research, development, and production in response to increasing energy demand and the need to reduce overall greenhouse gas emissions from transport fuels.

BP is focusing its alternative energy investments on areas where it believes it can create the greatest competitive advantage. It has chosen to focus on the technologies of wind and solar power, biofuels and carbon capture and storage.

Biofuels

BP has relished the opportunity to invest in a new high growth industry. In biofuels, there are many potential options for feedstocks, molecules and processes. BP is prioritizing what it identifies as the strongest biofuels options for increasing energy security, reducing greenhouse gas emissions and supporting sustainable agriculture.

In the longer term, through developments in feedstock and process conversion technologies, we believe biofuels offer the potential to comprise a material share of the transport fuels market in key regions. For example, the U.S. Department of Energy has forecast that biofuels could serve 20–30% of the U.S. transportation market by 2020. Additionally, the International Energy Agency has estimated that biofuels could form up to 30% of the global road transportation market by 2050, in work done in cooperation with the World Business Council project on Sustainable Mobility.

Importantly, biofuels offer the potential to deliver lower overall greenhouse gas (GHG) emissions compared with conventional fuels. Biofuels reduce GHG emissions entering the atmosphere on a total well-to-wheels or crop-to-car basis. That is, the carbon dioxide (CO_2) emitted when the biofuel is burnt in the vehicle is offset by the CO_2 absorbed during the growing of the crop. Future technology developments in the area of advanced biofuels offer the potential for biofuels to deliver GHG emission savings on a well-to-wheels basis of up to 90% *versus* conventional fuels. This can potentially be achieved through a combination of using less energy-intensive crops, or waste materials, and highly efficient/high yielding conversion processes.

BP Biofuels

BP has made a strategic choice to participate in biofuels. BP has identified biofuels, in particular advanced biofuels, as one of the most compelling options to reduce GHG emissions and address energy security and supply diversification needs. As one of the largest transportation fuel providers in the U.S., BP has long been one of the most significant blenders and marketers of biofuels in the nation. For example, last year BP blended over 1 billion gallons of ethanol with gasoline. In addition, biofuels are complementary to vehicle technologies which increase fuel economy, leading to a more sustainable transport fleet.

We believe BP is a natural leader in this space. BP has a long history of addressing the issue of increasing CO_2 emissions, offering increasingly cleaner fuels to customers and identifying new growth opportunities to develop our business. Biofuels serve markets we are familiar with and have incumbent positions in, and applications in which we have extensive expertise. It leverages our capabilities and insights into energy markets and logistics and project and operational management.

In 2006, BP decided to move beyond blending biofuels to also develop and manufacture our own biofuels. We formed a separate business within BP charged to develop this business opportunity. At the heart of our business is a desire to continually advance our ability to produce biofuels and advanced biofuels in a sustainable manner.

BP's Biofuels business has a focused strategy. We have three primary programs. First, we intend to produce cellulosic biofuels from dedicated energy crops in the U.S. Second, we are developing an advanced biofuels molecule called biobutanol that can be deployed in existing and new ethanol production units. Lastly, we are producing biofuels in Brazil using sugarcane as a feedstock.

Our U.S. business model is built on five strategic beliefs:

(1) We must create a new value chain within the U.S. to enable the growth of advanced biofuels. New partnerships are required to bring capabilities from agriculture, biotechnology, engineering, manufacturing and fuel distribution together in a unique way.

(2) There are multiple approaches to producing advanced biofuels, but we believe the fermentation of sugars from a variety of sources is one of the winning technology platforms for delivering this industry at scale.

(3) Technology development will make biofuels cost competitive and performance competitive with incumbent products by 2022.

(4) Transitional incentives and support structures need to be in place to bridge this nascent industry as the value chain forms and technology cost improvements are realized.

(5) Regulation, technology and good operating practice will enable a sustainable industry to form.

Our focus in the U.S. was catalyzed by the Energy Independence and Security Act of 2007. Through EISA, Congress created significant opportunities to develop and grow the contribution of biofuels to the U.S. transportation fuels market. EISA also served to move the industry beyond the good start the U.S. has had with corn ethanol. New support for the next generation of biofuels such as cellulosics and advanced molecules such as biobutanol created the opportunity for the development of a differentiated biofuels industry sooner than anyone had previously envisioned.

Our commitment to a public-private partnership in the area of advanced biofuels is very real. BP is investing $500 million over 10 years in the Energy Biosciences Institute (EBI). The EBI brings BP together with experts from the University of California at Berkeley, The University of Illinois at Urbana Champaign and the Lawrence Berkeley Labs. We have created an institute at which biotechnologists are able to investigate many possible applications of biotechnology to energy, including advanced fuels. The EBI's work also includes research into the social and economic impacts of biofuels.

BP Biofuels Programs

BP intends to produce cellulosic biofuels in the United States. Our cellulosic biofuels program is focused on two key technology pathways. First, we intend to utilize dedicated energy crops, such as high-yielding perennial grasses, as feedstocks. Second, we intend to utilize a biochemical conversion process to produce the biofuel from the feedstocks.

BP has created a joint venture company called Vercipia Biofuels with Verenium Corporation to build the first commercial scale cellulosic biofuels facility in the U.S. To date, BP and Verenium have made a total commitment of $45 million to the venture. The joint venture company is led and supported by a team comprised of employees from both BP and Verenium.

The formation of the Vercipia Biofuels joint venture builds on the $90 million investment made by BP in 2008, which allowed the two companies to further advance Verenium's original cellulosic technology and ensure delivery of Verenium's 1.4 m gallon/year proof-of-concept demonstration facility in Jennings, Louisiana.

BP and Verenium's proprietary technology enables conversion of nearly all the sugars found in cellulosic biomass, including both 5-carbon and 6-carbon sugars into ethanol. This technology is a reality today. Our focus, going forward, is to enhance and improve the efficiency of the technology so that it can be deployed at pace and scale.

Vercipia Biofuels is progressing the design and engineering required to develop one of the first commercial scale cellulosic ethanol facilities in the U.S., located in Highlands County, Florida. The estimated construction cost for this 36 million gallon per year facility is between $250 and $300 million. The Vercipia Biofuels joint venture plans to break ground on the facility in 2010 and be fully operational in 2012. With plans to add additional capacity, the joint venture company intends to develop a second site in the Gulf Coast region.

The ethanol produced in our first facility in Florida will be developed with energy grass feedstocks such as energy cane. We believe energy grasses will be an essential part of the future U.S. feedstock mix, given their high yield, yield improvement po-

tential and reduced pressure on land resources. Going forward BP intends to progress other cellulosic facilities in the U.S. and broaden our energy grass feedstock portfolio. BP's intent is to continue to scale up the production capacity of future units as we move toward a cost structure that can compete with traditional transport fuel sources.

In the area of advanced molecules, BP is focusing on biobutanol. Biobutanol is an advanced biofuel molecule that builds on the benefits of the ethanol molecule and adds additional strengths. These additional strengths include:

- It can be produced from the same feedstocks as ethanol through modest upgrades of existing facilities.
- It is less susceptible to separation in the presence of water than ethanol/gasoline blends, and therefore can use the industry's existing distribution infrastructure without requiring modifications.
- A 16% blend can be used in all existing vehicles and infrastructure, offering consumers better fuel economy than E10 and double the GHG benefit as E10 making it an efficient enabler of the renewable fuels objectives set out by Congress in the EISA.

BP believes biobutanol will help to accelerate the adoption of biofuels and assist in overcoming the blend wall, so that the U.S. can meet targets for reducing greenhouse gas emissions from transport more quickly. We have created a joint venture with DuPont called Butamax for the development and commercialization of this fuel molecule. We are currently building a demonstration facility in the UK and hope to be able to commercially deploy our technology in the U.S. during the 2012 to 2013 time-frame.

Outside of the U.S., BP has focused its current investments in biofuels production on Brazilian ethanol made from sugarcane. Brazilian sugarcane ethanol has a wells-to-wheels GHG footprint that is at least 50% less than conventional gasoline. BP has made the largest investment to date by an international oil company in the Brazilian ethanol production industry by taking a 50% stake in the Tropical BioEnergia joint venture, which already has one refinery producing ethanol.

Advanced Biofuels Industry Challenges

BP is a strong supporter of advanced biofuels. However, we do recognize there are challenges to advancing the biofuels industry in the U.S. Biofuels is about bringing together our two most important value chains—agriculture and energy. We do not take this challenge lightly.

Our nation's initial focus in the biofuels industry was on making ethanol and biodiesel from existing agricultural commodities using existing, well established and proven manufacturing technology. Financing for this first wave of the industry came from the agricultural community and later from a large infusion of financial capital from private investors and the banking sector. The ethanol and biodiesel markets formation benefited from readily available feedstocks, off-the-shelf technology and a vibrant investment climate. With limited barriers to entry the first generation industry rapidly expanded to meet and exceed the targets set out by Congress.

With the rapid development and success of the corn ethanol biofuels, the biofuels industry began focusing on ways to produce more sustainable biofuels with strong environmental thresholds. However, the development and deployment of an advanced biofuels industry would not have been as quick were it not for passage of the EISA in 2007.

To properly evaluate policy options for the advanced biofuels industry, one must consider several critical differences between current generation biofuels and advanced biofuels. *First,* advanced biofuels are the largest portion of fuels in the 2007 EISA. Advanced biofuels in general, and cellulosic biofuels specifically, do not have existing or well developed feedstock supply value-chains. Whether the feedstock is high yield energy grasses or various waste products from forestry or agriculture, these value chains need development. This market development will take time and will include participation from land owners, farmers, seed companies, agricultural and forestry equipment OEMs, agricultural banking sectors and insurers, and transportation companies. We need to continue to nurture and stimulate the development of this value chain.

Second, the technology for conversion of the feedstocks to biofuels is still being developed. Yes, we can produce advanced biofuels today, but they are not cost competitive with current biofuels. Many technologies are not yet readily available to the market. Most of the companies in this space are technology startups. Generally speaking, the companies are good at developing technology, but lack the capabilities to scale the technology into major capital projects. As unit capacities increase over time, these projects could cost upwards of $500 million each. This industry will

therefore be enabled by partnerships that bring together small technology companies and large processing companies—such as BP—who have the project management, engineering, and operational skills to bring to scale the technology.

Third, private investors and the banking sector are in a very different state than during the surge of funding for biofuels in 2006 and 2007. Venture capitalist funding supports the development of start-up technology companies and much of that investment is limited until they see proof-of-concept in the industry. The banking sector's support is required for investments in the scale-up of commercial facilities. Given the recent recession and the banking sector's financial difficulties, lending has become scarce in the biofuels space. New investments in advanced biofuels are having difficulties gaining financing even with current government support structures due to the evolving technology state of the industry.

Even if the recession and banking sector challenges had not occurred, the business risk for advanced biofuels is not the same as it was corn for ethanol. The banking sector does not yet view the advanced biofuels value chains as proven and reliable or new conversion technologies as low risk investments. Even though government initiatives such as the Renewable Fuels Standard, tax credits, USDA and DOE grants and loan guarantee programs are in place to stimulate and mitigate the risk of investments, the banking industry still does not see them as low enough risk at this point in the national economic recovery. Thus capital markets are frozen for major advanced biofuels capital projects.

The confluence of these factors has led to slower progress for advanced biofuels in the U.S. than otherwise expected. However daunting these challenges may seem, they are not insurmountable.

Advanced Biofuels Industry Solutions

To achieve the national goals on energy security, progress on GHG emissions, and further rural development, BP supports a robust biofuels industry where many players will bring forward a variety of technology and commercial solutions. Partnerships between different types of companies—large and small, technology and manufacturing, agricultural and energy, financial and operational—through extended value chains—will be needed to make this industry work.

Specifically, we need the stability of a long-term governmental support structure to de-risk the investment in advanced biofuels. Congressional support that is short, has uncertain time-frames or is continually evolving creates uncertainly which translates into financial risk. Stability and certainty in the existing EISA programs are vital to mitigating the risk associated with investing billions of dollars in evolving technology. Investors and developers must see a secure market. A stable framework to support the evolving industry will go a long way to accelerating the industry toward achieving national energy and environmental goals.

The framework in BP's view must continue to include a set of transitional support mechanisms that bridges today's nascent industry and allows companies such as BP, our partners Verenium and DuPont and other leading players in the industry the time and space to deliver at scale a cost efficient, sustainable solution for U.S. transport energy needs. Transitional support mechanisms such as the cellulosic biofuels production tax credit and the biomass crop assistance program are very important as we make initial investments in technology that is yet to be competitive with traditional fuel sources.

We believe the USDA and the DOE must continue to play a pivotal role in developing the advanced biofuels industry. We look to the USDA's leadership in helping to support feedstock development and the formation of the upstream portion of the value chain. We look to the DOE's leadership in helping to support the downstream conversion technology portion of the value chain. Importantly, the DOE will need play a key role in the initial funding of advanced biofuels, as the initial commercial-scale facilities will be more expensive to build than current generation biorefineries. The USDA and DOE along with other policymakers must recognize the developmental nature of the advanced biofuels industry and help to manage the risks that companies such as BP and the other early leaders in this field are facing as we attempt to create this new industry. In this effort, the government can and will play a critical role.

Assuming supply side dynamics are addressed, there remain demand side barriers to be resolved. The most pressing issue is solving the so-called blend wall issue—the market's inability to absorb additional biofuel volumes. The blend wall results from well intentioned but disconnected energy policy and legal frameworks. BP believes that a combination of time, technology development, and policy support and infrastructure investment will solve this problem. We believe advanced molecules such as biobutanol can assist in lessening the effects of the blend wall in the mar-

ketplace. But, as fuel suppliers and policymakers, we need to be sensitive to these dynamics to ensure that consumer expectations continue to be met.

Closing Comments

I want to thank the Committee for giving me the opportunity to share our thoughts on the issues and challenges facing the advanced biofuels industry. BP appreciates the energy security, economic, and environmental challenges faced by the U.S., and wants to be a part of the solution.

I am convinced that the biofuels industry has the potential to make a positive contribution to energy security, climate change mitigation and rural development. Biofuels today play a key role in delivering sustainable transport fuels to U.S. motorists and will continue to do so well into the future.

BP is committed to working with Congress and others to address the energy and environmental needs of this nation through comprehensive energy policy solutions. BP believes we must have an all the above strategy to meet the growing demand for energy around the world and biofuels is a key component to that strategy.

The CHAIRMAN. Thank you.

Mr. Roe.

STATEMENT OF WILLIAM J. ROE, PRESIDENT AND CEO, COSKATA, INC., WARRENVILLE, IL

Mr. ROE. Thank you, Mr. Chairman.

My name is Bill Roe and I am the President and CEO of Coskata, an Illinois-based company that has developed and is commercializing a process to produce lower cost fuel-grade ethanol from a wide variety of non-food raw materials. I thank the Subcommittee for the opportunity to speak with you today about the future of biofuels in this country. My comments and recommendations here are being delivered on behalf of my company.

In my opinion, there are three fundamental questions that any developer and producer of next generation biofuels must be able to answer affirmatively. First, can the alternative fuel compete with gasoline without need for long term government initiatives and subsidies? Two, can the technology scale commercially and create sustainable jobs in the process? And three, does the alternative fuel have a lifecycle environmental footprint that is significantly better than that of petroleum-based fuels? Now, there is fact and there is fiction in terms of how some would answer these fundamental questions, and if there is one thing that I would like to be able to convey today it is that there are companies that can answer these questions affirmatively. We all need to be able to discern some of the positive realities from the often incorrect critical rhetoric that surrounds the subject of biofuels.

So a little bit of industry landscape, first let me suggest that the biofuel industry is best thought of as one in transition. First generation of biofuels in the U.S. has consisted principally of ethanol produced from corn and biodiesel derived substantially from materials like soybeans. A really remarkable job was done, particularly over the past few years, in getting somewhere between 10 and 12 billion gallons of production capacity in place. That said, there are restrictions and limitations, some real, some imaginary that are impeding the further expansion of first generation capacity. The current RFS caps conventional biofuels at 15 billion gallons per year, which is just slightly over the current U.S. capacity. So the key to the future of biofuels is going to be the feedstock flexibility of emerging technologies and the availability of alternative feedstocks.

There are a host of cellulosic and other advanced biofuel technologies that have emerged over the last 2 to 3 years, and I describe and categorize them for you in my written testimony. Several are showing early commercialization potential and others appear technically sound but will be slower to scale. My company, Coskata, is commercializing a process to produce low cost ethanol with a feedstock flexible process that can use as the raw material woody biomass, agricultural waste, waste wood and construction and storm debris, purpose-grown energy crops, and even municipal solid waste and old tires. The efficiency of the process and the low cost of some of the feedstocks allow us to produce fuel-grade ethanol that can compete with gasoline at today's oil prices even without subsidies.

Furthermore, the greenhouse gas footprint of our process was calculated by Argonne National Laboratories and was found to be up to 96 percent lower in lifecycle greenhouse gas emissions than the well-to-wheel analysis of that of gasoline. And to shatter the myth that biofuels consume more energy in their production then they generate, Argonne also calculated that the Coskata bioethanol process produces up to 7.7 times as much fuel energy as it consumes. The technology is in place. We are proving the process at significant scale in our demonstration facility in the Commonwealth of Pennsylvania, and we have designed the first full-scale plant which we hope to finance and begin constructing in the next months. We are not alone here. There are a number of other companies in a similar position to commercialize promising new production processes.

So what can you do to help? Everything that I have heard this morning suggests that you are really on a lot of these points. First of all, ensure that we have a consistent and inclusive *biomass* definition. The Energy Policy Act of 2005, ACES of 2007 and the farm bill in 2008 all have different and conflicting definitions. Number two, help address the blend wall issue. Congress mandated the use of 36 billion gallons of renewable fuel by 2022 which can't be realized until the EPA lifts the arbitrary blending limit of ten percent in gasoline. We urge you to use your influence with the EPA. Third, adopt carbon legislation that expressly recognizes biofuels as a solution to reduce greenhouse gas emissions and to specifically recognize biomass-based fuels as carbon offsets. Four, establish a green bank. We commend Congress for including the Clean Energy Deployment Administration in the ACES bill but believe this Administration should be independent and not under the authority of the DOE as suggested in the Senate version. Five, extend the cellulosic producer tax credit, this expires in January of 2012 and consequently would provide little or no impact to even the earliest industry movers. Six, create flexibility and modernization of tax credits allowing the option to take them as an up-front credit or grant, as was done with the solar and wind tax credits, this would help the industry to use these to finance projects. And last but not least, more needs to be done to develop and promote the production of renewable feedstocks.

So in summary, the biofuel industry is at a tipping point with a number of companies on the verge of commercializing alternative fuel platforms that are going to reduce our dependence of foreign

oil, create jobs here that can't be exported and dramatically improve the environmental sustainability of liquid transportation fuels, and your help in creating consistent and enduring policies to facilitate this is needed and appreciated. Thanks for allowing me the time.

[The prepared statement of Mr. Roe follows:]

PREPARED STATEMENT OF WILLIAM J. ROE, PRESIDENT AND CEO, COSKATA, INC., WARRENVILLE, IL

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to appear today to testify about the future of biofuels. My name is Bill Roe and I'm the President and CEO of Illinois based Coskata, Inc. and my comments and recommendations are being delivered on behalf of my entire company. If there is one thing I would like to be sure to convey today, it is that there are technologies to allow non-grain based biofuels to be produced that will compete with gasoline. The United States has been working on non-grain based biofuels for more than 20 years, and we believe that a scalable and sustainable ethanol solution is now available.

I. About Coskata and its technology

Coskata is a biology-based renewable energy company, whose technology enables the low-cost production of ethanol from a variety of input material, including wood biomass, agricultural and municipal wastes, new energy crops, and other carbonaceous material.

We employ a simple, three-step process that can convert these feedstocks into ethanol in an extremely energy and cost efficient way, while addressing many of the constraints of current renewable energy options, including environmental, transportation and land use concerns.

- **The first step is gasification:** The feedstock is thermally broken down to form synthesis gas (syngas), a mixture of carbon monoxide, hydrogen and carbon dioxide molecules.
- **The second step is fermentation:** The syngas is sent to a proprietary bioreactor where patented microorganisms consume the gas as food and produce ethanol.
- **The third step is separation:** Using conventional distillation and dehydration technology, the ethanol is separated from the water, resulting in fuel-grade ethanol.

Our technology gives us many advantages over conventional gasoline. In addition to being able to reduce greenhouse gases by up to 96% over conventional gasoline, Coskata's process is among the industry's most efficient ethanol conversion technologies. We can produce approximately 100 gallons of ethanol per dry ton of biomass material. In addition, we believe our ethanol will be able to compete directly with gasoline without long-term government subsidies. Our feedstock flexibility is a key to sustainability, in that the Coskata process is capable of utilizing all of the feedstocks named in the Department of Energy's "Billion Ton Study".

We are currently demonstrating this technology on a significant scale at our demonstration facility, located in Pennsylvania. The facility represents the successful scale-up of our technology and allows Coskata to start building and licensing commercial facilities. This is a major accomplishment for our company, and was a critical step that was necessary before bringing the process to full commercial scale.

II. Biofuel Industry Landscape

The biofuel industry in late 2009 is best thought of as an industry *in transition.* The first generation of U.S.-manufactured biofuels that have been derived from corn, sugar cane, soybean oil, *etc.*, have been defined both in terms of present and potential future impact. Further expansion of ethanol produced from corn or biodiesel produced from soybeans is unlikely to be substantial, the limitations primarily stemming from the availability and cost of the actual feedstock materials. However, next-generation technologies are being developed and commercialized, using a much wider variety of input materials that will be available at a lower cost than materials grown primarily for food.

In 2007, a mandate was created by Congress in the form of the Energy Independence and Security Act, which defines the requirements for the production of 36 billion gallons of renewable fuel by 2022. That 36 billion gallon requirement breaks down to:

- 15 billion gallons of "conventional" renewable biofuel.
- 16 billion gallons of cellulosic biofuel.
- 5 billion gallons of other "advanced" biofuel.

At this juncture in late 2009, there is an estimated capacity to produce "conventional" renewable biofuel (for the most part ethanol derived from corn) in the range of 12 billion gallons, not all of which is operating. At this same point in time, there is essentially no material production capacity on line for either cellulosic biofuel or other advanced biofuels. That said, since the EISA mandate came into being, there has been tremendous activity in both the private and public sectors to develop the technology platforms necessary to meet the requirements, and some of the more promising are now beginning to scale to commercial levels.

The technologies that are emerging include, but are not limited to, the following:

- *Cellulosic biofuel technologies*

  Ethanol from enzymatic hydrolysis of cellulose + fermentation
  Ethanol from acid hydrolysis of cellulose + fermentation
  Ethanol from biomass gasification + catalytic conversion of syngas
  Ethanol from gasification + biological conversion of syngas
  Butanol from enzymatic hydrolysis of cellulose + fermentation
  Synthetic diesel from gasification + catalytic conversion of syngas
  Synthetic crude oil from biomass catalytic cracking or pyrolysis
  Hydrocarbon fuels from bio-fermentation of sugars

- *Other advanced biofuel technologies*

  Synthetic hydrocarbons or alcohols from algae
  Hydrocarbon fuels from conversion of animal waste or by-products
  Hydrocarbon fuels from food waste including recycled oils/greases
  Ethanol from fermentation of sugars from non-corn feedstocks

In our opinion, many of these emerging technologies are showing promise, and some will commercialize faster than others. None, however, will scale quickly enough to enable the industry to meet the current requirements of the RFS *in the early years*. There are several companies with technologies that are sufficiently advanced that are going to commercial scale ***now,*** and can have a significant impact on **meeting the requirements for cellulosic and other advanced biofuels in the 2016–2017 time-frame.**

The commercialization of "next-generation" biofuels was expected to be faster, and there are several factors that have slowed progress. First, the incubation and maturation of some of the technology platforms has taken longer than many anticipated. Second, the collapse of the credit markets all but stopped the advancement of early commercial projects. While the DOE and USDA have sponsored grant and loan guarantee programs to assist companies in the alternative energy space to finance their endeavors, ***very few awards have gone to biofuel companies, and the few that did have not yet been acted upon.*** And third, the commercialization rate of new biofuel technologies has been hampered in some measure by the lack of consistent government policy. For example, the current blending limit established by the EPA for ethanol in gasoline for use in conventional automobiles is ten percent, which has created the so-called "blend wall," and is inconsistent with the mandate established in the current Renewable Fuel Standard. Biofuel developers have been therefore unable to plan future projects in the absence of a more consistent and long-range policy from the government.

While there have been challenges, we believe that despite those challenges the U.S. is at the cusp of being able to move forward rapidly in the near term. It has been our belief that any developer of new alternative transportation fuels has to be able to answer three fundamental questions affirmatively:

1. Can the process compete with gasoline economically, without the aid of long-term government incentives and subsidies?
2. Can the technology commercially scale in a sustainable manner?
3. Does the production and use of the alternative fuel have a significant positive environmental impact over the entire lifecycle of the fuel?

III. Building a Sustainable Biofuels Industry

There are technologies that are scalable ***today*** that allow affirmative answers to the above questions. And there are companies that are capable of scaling new technologies that will:

- Compete with oil and allow the U.S. to reduce our dependence on foreign oil
- Scale effectively and sustainably while creating new jobs around the country
- Replace petroleum-based fuels with alternatives that are environmentally sustainable over their entire lifecycle

Advanced biofuels can compete with and reduce the consumption of oil

When taking into account a few assumptions, cellulosic biofuels can compete directly with oil when prices are in the $70–$90 per barrel range.[1] With oil prices currently around $80 per barrel and the Energy Information Administration (EIA) predicting the price per barrel to settle around $130 over the next 20 years,[2] the industry is feeling confident in its ability to compete with oil without long-term government subsidies.

By economically competing with oil, advanced biofuels have a real opportunity to reduce our dependence on oil by reducing imports. In fact, advanced biofuel production under the RFS could reduce U.S. petroleum imports by approximately $5.5 billion in 2012, $23 billion in 2016, and nearly $70 billion by 2022. The cumulative total of avoided petroleum imports over the period 2010–2022 could exceed $350 billion.[3]

In addition to the obvious economic benefits, this enormous reduction would provide tremendous socioeconomic and geopolitical benefits. Given that the U.S. imports more than 65% of our oil—much of it from countries who don't share our same political and economic beliefs—being able to produce fuel from materials we grow and/or gather within our borders will keep dollars in the United States, as well as serving to create and maintain jobs.

The biggest hurdle we face as an industry is the lack of project finance to start building early-stage facilities. The issue is no longer that advanced biofuels are 5–10 years away from being cost competitive. They are competitive today, but we need help getting the first facilities off the ground in the face of difficult capital markets.

Advanced biofuels can scale effectively and sustainably while creating jobs

For biofuels to make a meaningful impact, it's critical that we're able to scale rapidly and sustainably. As I stated earlier, it is unlikely the industry will meet the mandate of 100 million gallons of cellulosic ethanol by 2010. However, because several feedstock-flexible companies in the industry are ready to go to commercial scale now, it's very conceivable that the industry will still meet the full RFS mandate by 2022.

Feedstock flexibility is a major component of why we believe the industry will not only be able to scale rapidly, but more importantly, will be sustainable over time. One major lesson we have learned from the corn ethanol and biodiesel businesses is that being dependent on only one feedstock can not only lead to a volatile price structure, but it also places geographic production restrictions that lessen the overall environmental profile of the fuel.

This is why it is essential for the biofuel industry to be early adopters of a feedstock flexible approach toward conversion technologies. Only by using a diverse array of feedstocks will the industry be able to convert the 1.3 billion tons of renewable biomass that is available each year[4] and do so without significant land use changes.[5] This approach affords two main benefits:

1. It helps reduce the exposure to commodity price volatility, which has recently been a major problem for grain-based fuel producers. This reduction in exposure is essential to keep prices steady and ensure long-term viability.

2. It allows for geographic flexibility and therefore a wider distribution of the economic benefits associated with its adoption. Companies with feedstock agnostic technologies can build facilities all over the country: the Southeast, where

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[1] Sandia National Laboratories, *90-Billion Gallon Biofuel Deployment Study.* February 2009.

[2] Information Administration (EIA), Annual Outlook 2009. DOE/EIA–0383. Washington, D.C., June 2009

[3] BIO Economic Research Associates, *U.S. Economic Impact of Advanced Biofuels Production: Perspectives to 2030.* February 2009.

[4] U.S. Department of Energy and U.S. Department of Agriculture, *Biomass as Feedstocks for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply.* April 2005.

[5] Sandia National Laboratories, *90-Billion Gallon Biofuel Deployment Study.* February 2009.

wood biomass is abundant; the Midwest, where they produce ample amounts of agricultural waste; or large urban areas, with high volumes of municipal solid waste. That way, when the advanced biofuels industry grows to the levels established in the Renewable Fuel Standard, the more than 800,000 new jobs that will be created[6] can be spread from coast-to-coast in sectors of the economy that have experienced the highest rates of job losses over the past year, including agriculture and construction.

Advanced biofuels are environmentally beneficial over their entire lifecycle

It is no surprise that one of the main reasons government policy is being established to promote the growth of the biofuel industry is because of its clear environmental superiority over petroleum. In fact, cellulosic ethanol on average has the ability to reduce GHGs by anywhere from 50–96%. That means 60 billion gallons of ethanol could provide annual GHG savings of 260 million tons of CO_2e per year. This is equivalent to shutting down 45 coal-fired power plants.[7]

For Coskata, Argonne National Labs performed a "Well-to-Wheel" analysis to determine the true carbon reductions possible with our technology. They found that our technology has the ability to reduce greenhouse gas emissions by up to 96% *versus* conventional gasoline when looking at the entire lifecycle of the process. As we've learned from our grain-based pioneers, viewing the environmental impact through the prism of the entire "lifecycle" is fundamental.

Another important area not to be overlooked is water use in the industry. According to a water study performed by Argonne National Labs in 2009, 3–6 gallons of water are used for every gallon of gasoline produced in the U.S. We believe that we will be able to produce a gallon of ethanol using less than 2 gallons of water from a wet ton of biomass, and that our industry partners are not far away. Water issues are only growing in importance, and as an industry we remain committed to utilizing water in a sustainable way.

IV. We need enduring government policy

Congress has been prolific in recognizing the tremendous benefits that advanced biofuels can contribute. The passage of EISA in 2007 and the 2008 Farm Bill have allowed significant progress for our industry in establishing market demand for our product and providing various incentives for its production. However, we believe Congress has a great opportunity, and indeed an obligation, to establish enduring policy that will catapult our industry forward, and ensure that it can deliver on these promises. We believe the focus of such an enduring policy should be threefold:

1. Ensure consistent, transparent and fair regulatory regimes governing our industry.
2. Establish alternative financing mechanisms for the impending technology roll out.
3. Ensure the entire supply chain is ready for scale up.

Consistent, transparent and fair regulatory regimes

Biofuels producers have had a hard time planning future projects because of the lack of a consistent, transparent and fair government policy toward biofuels. This includes a consistent and inclusive biomass definition, an easing of the current "blend wall," and a uniformly applied methodology to calculate carbon benefits.

- **Ensure consistent and inclusive biomass definition—** The EPAct 2005, EISA 2007 and Farm Bill 2008 all have different definitions for acceptable "Renewable Biomass." In order to avoid roadblocks down the road, we urge Congress to set an inclusive definition of biomass to be used by all Federal agencies and set a level playing field allowing the best technologies to compete. Such a definition should be as inclusive as possible, so as to not artificially limit the potential supply of advanced biofuels. Specifically, the Renewable Biomass definition across regulations should include all forms of wood and waste, including those produced on Federal Lands, Construction and Demolition Debris (C&D), and Municipal Solid Waste (MSW). Congress should also limit the record keeping requirements with regard to biomass origins on biofuel producers, and ensure that those record keeping requirements are consistent across all other biomass-based industries such as renewable power generation.
- **Address the blend wall—**Congress mandated the use of 36 billion gallons of renewable fuel by 2022. This mandate will not be realized unless the govern-

[6] *Ibid.*
[7] Sandia National Laboratories, *90-Billion Gallon Biofuel Deployment Study.* February 2009.

ment removes artificial restrictions on ethanol and approves the use of higher ethanol blends in America's vehicles. We urge Congress to urge the EPA to lift the arbitrary limit on ethanol, especially considering the science supports the use of E15.

- **Carbon offsets and credits—**We urge Congress to adopt carbon legislation that expressly recognizes and encourages biofuels as a solution to reduce greenhouse gas emissions. Specifically we ask that the biofuel component of fuel blends be excluded from the cap since biofuels are already regulated under the Renewable Fuel Standard. We also urge Congress to continue to recognize the carbon neutrality of biofuels and to specifically recognize the ability of biomass based fuels as carbon offsets.

We commend you and your colleagues in the House of Representatives for recently passing the American Clean Energy and Security bill (ACES), which goes a long way towards addressing these Renewable Biomass and carbon issues, and we encourage your colleagues in the Senate to follow your example.

Establish alternative financing mechanisms for technology roll out

While there have been some efforts aimed at encouraging commercial scale development within the industry, it is our experience that most of these programs have fallen far short of expectations. The industry could benefit from new policies that encourage investment and ensure a stable market for biofuels in the future. The technologies are ready, but the U.S. Department of Energy's expectations for credit risk profiles are unreasonable. We need to establish new funding mechanisms to deploy new energy technologies and provide new energy companies a way to utilize tax credits.

- **Establish a Green Bank—**We commend Congress for including the Clean Energy Deployment Administration (CEDA) in the recent passage of the ACES bill. We believe CEDA will be instrumental for accelerating the deployment of advanced biofuels. In order to maximize the effectiveness of this new entity, we believe this Administration must be independent and modeled on successful public-private financial institutions such as the Export-Import Bank and not be under the authority of the Department of Energy as suggested in the Senate version of the legislation.
- **Extend cellulosic producer tax credit—**Under current law, the production tax credit for cellulosic biofuels is only available for eligible fuel produced before 1/1/2012. This constitutes a significant impediment to investment considering only few commercial cellulosic facilities will be placed into service by that time. By amending section 40(b)(6)(H) to cover all fuel produced before 1/1/2022, Congress would help stimulate private investment by incentivizing these innovative technologies. In addition, the current structure of this credit—the VEETC excise tax credit available to blenders with the balance as a producer tax credit (PTC)—creates unnecessary confusion over the total value of the PTC since it is dependent on the value of the VEETC, going forward. Congress could help by amending section 40(b)(g)(H) to remove the VEETC component, making the entire value of the PTC available to cellulosic ethanol producers.
- **Allow flexibility in the monetization of tax credits—**Biofuel tax credits are currently very difficult to monetize, causing capital hungry start-ups to sell their tax credits at a substantial discount (>40%) if they can find a counterparty at all. Instead, Congress should re-structure these credits to allow the option of taking them as a one time, up-front, investment tax credit/grant that can be used to finance projects, mirroring the solar and wind industry PTCs.

Ensure the entire supply chain is ready for scale-up

In order to make a meaningful impact on the country's overall energy mix, Congress must invest in both the front and back end supply chains.

- **Ensure proper feedstock development—**Help initiate demonstration projects throughout the country for the establishment, production, harvest, collection, storage and transportation of cellulosic feedstocks. We commend Congress and the USDA for their work in this area and look forward to seeing positive impacts from the Biomass Crop Assistance Program (BCAP) and some of the recent grant programs from the U.S. Department of Agriculture.
- **Fund investments in fuel delivery infrastructure—**Although a fair level of infrastructure is already in place, it's important for Congress to continue fostering the development of flex fuel vehicles, rail expansion, construction of blending facilities and E85 fuel pumps.

V. Conclusions

The biofuel industry is now at a tipping point. Many technologies are showing tremendous promise and are going to commercial scale ***now.*** Our technologies can compete with gasoline without long-term government subsidies, can scale rapidly and sustainably, and can help deliver real environmental benefits. The leading venture capital and private equity investors in the world are putting their money behind the industry. With the help of government policy, even major oil companies are now seeing the benefits of investing in feedstock-flexible ethanol technologies. We have the ability to meet the primary energy goals of Congress by reducing our dependence on oil, ensuring environmental sustainability, and creating jobs in every corner of the country. What we need is enduring government policy that will help stimulate the significant capital investment that it will take to ensure this change.

Thank you for the opportunity to present today. We look forward to working with Members of Congress and the entire industry in bringing a sustainable alternative to oil to the world.

The CHAIRMAN. Thank you.

Mr. Jamerson.

STATEMENT OF BRUCE A. JAMERSON, CHAIRMAN, BOARD OF DIRECTORS, MASCOMA CORPORATION, LEBANON, NH

Mr. JAMERSON. Thank you, Mr. Chairman, and Members of the Subcommittee. I appreciate the opportunity to testify. Thank you for the opportunity to be here today.

Mascoma is an energy biotech company. We have corporate offices and a large R&D lab in Lebanon, New Hampshire. We have a fully operative demonstration plant in Rome, New York, and we are developing our first commercial scale plant in northern Michigan. We were founded 4 years ago. We have raised about $100 million of equity investment. We have 100 employees, about 75 are scientists. Our Consolidated BioProcessing Method converts non-food feedstocks such as woody biomass, sugarcane bagasse, corn stover and energy grasses into low carbon cellulosic ethanol. Our Kinross, Michigan biorefinery is in a rural area. Once operational, it will employ 50 to 60 highly skilled people and according to the State of Michigan the construction, maintenance and operation of the facility will create approximately 450 indirect jobs for a total of about 500 regional jobs over the next 5 years.

I am going to talk about our experience with the USDA loan guarantee program. Given the current loan structure at the USDA and the challenging credit markets, banks are reluctant to provide project financing and to use the loan guarantee program as currently structured. We applied for the guarantee. We approached 174 commercial lenders. Only two of them were willing to work with us. We selected one but in the end they were unable to move forward due to structural challenges with the loan guarantee program. I am going to give you some detail on those concerns.

For example, as the project size increases, the loan guarantee amount reduces so that discourages larger projects. There is a requirement to hold a minimum. The bank has to hold a minimum of 50 percent of the non-guaranteed portion of the loan that has to have the same terms for the non-guaranteed and guaranteed portion of the loan. They limit to one percent the difference between the guaranteed portion and the full loan amounts. We also, think that we should be able to use the Federal Financing Bank instead of having to seek commercial banks to allow the guarantee to apply to a revolving credit facility for working capital, and to be able to

replace the non-guaranteed portion of the loan with equity or subordinate debt. So those are some comments I would have on changing the program.

While it is not the jurisdiction of the Committee, I would echo what Bill said about the investment tax credit that the wind and solar industry have obtained that is refundable through a monetized Treasury Department grant. This mechanism has proven to be very effective for jump-starting renewable electricity projects in wind and solar, and we believe that a similar 30 to 40 percent refundable investment tax credit for advanced biofuels would be very significant in attracting private equity to the sector. We are very grateful for the Federal support of commercial cellulosic biofuels and we are confident in our technology. We have invested a lot in it, however given economic conditions we will need continued Federal commitment to support the industry. Thank you.

[The prepared statement of Mr. Jamerson follows:]

PREPARED STATEMENT OF BRUCE A. JAMERSON, CHAIRMAN, BOARD OF DIRECTORS, MASCOMA CORPORATION, LEBANON, NH

Good morning, Mr. Chairman and Members of the Subcommittee. I appreciate the opportunity to testify on behalf of Mascoma Corporation today. I have been active in the biofuels industry since 2001, having previously served as President of corn ethanol producer VeraSun Energy and CEO of Mascoma.

Mascoma Corporation is an innovative biofuels company committed to developing environmentally sustainable, low cost, low carbon biofuels from cellulosic biomass. The company's corporate office and R&D laboratories are based in Lebanon, New Hampshire. Mascoma is producing cellulosic ethanol on a demonstration scale at its facility in Rome, New York. Its affiliate, Frontier Renewable Resources, is developing a commercial scale production facility in Kinross, Michigan.

Background on Mascoma's Technology and Facilities

As being described today, there are a number of different technologies that may be used to transform excess and waste biomass to ethanol, and long term, to other biofuels and biochemicals. Depending upon available feedstocks and other region and site-specific factors, different cellulosic conversion processes will better suit specific regions of the country. For example, wood chips may be used in northern climates, sugar cane in the Gulf Coast, and corn stover in the Midwest. A diverse portfolio of technologies and fuels will be required to meet the United States liquid fuels demand in the coming years, and Mascoma is confident that we can meet that challenge. We know that the technologies exist to convert cellulosic material into fuels. Our focus now is to scale up our process to operate on a cost competitive commercial basis.

Mascoma's Consolidated BioProcessing method converts non-food biomass feedstocks into cellulosic ethanol through the use of a patented process that eliminates the need for costly enzymes and additives. This transformative technology enables ethanol competitively priced with gasoline to be derived from cellulose in a manner not previously possible. The processing steps involve:

1. Sustainable harvesting of pulpwood (the feedstock we are using in our first plant).
2. Pulpwood chipping.
3. Pretreating the feedstock by cooking and processing the wood chips into a softened material (similar to peat moss).
4. Combining the pretreated material with proprietary microorganisms in a fermenter, and fermenting the cellulose into ethanol.
5. Recovering ethanol and lignin from the process. Cellulosic ethanol is blended with gasoline as a low carbon motor fuel. The unconverted fiber, called lignin, is used as a low carbon boiler fuel or converted into other non-ethanol fuels.

Since several different biological actions that carry out this transformation are consolidated into a single type of microorganism, our method is referred to as Consolidated BioProcessing or CBP. The technology is derived from an array of molecular tools used to manipulate the makeup of the organisms. Unlike other biological

methods of producing ethanol, Mascoma's CBP process eliminates the need to add expensive enzymes used to convert cellulose into the sugars needed to produce ethanol. Since enzymes are one of the highest cost components of cellulosic ethanol production, eliminating them greatly decreases the cost of production.

Mascoma's aim is to develop the lowest cost technology for low carbon cellulose ethanol production that will, in turn, be used in commercial scale ethanol facilities in rural America that will create new economic opportunities for local feedstock providers, create jobs, and lessen our dependence on foreign oil.

Efforts Underway to Develop First Commercial Facility

Mascoma, in conjunction with J.M. Longyear, is actively developing the first commercial scale production facility through its affiliate Frontier Renewable Resources in Kinross, Michigan. The facility will utilize sustainable, lower-value wood products such as pulpwood chips to produce up to 80 million gallons of cellulosic ethanol per year. We have spent considerable time analyzing feedstock availability to ensure sufficient supplies of pulpwood. The feedstock supply will exclude wood chips from sawlogs or veneer logs, which are too valuable for use in biofuel production.

I want to thank the Committee for its leadership and work to reconcile the definitions of renewable biomass included in the 2008 Farm Bill and the Renewable Fuels Standard in the 2007 Energy Bill. The clarification included in the American Clean Energy and Security Act of 2009 is of significant help to us in obtaining our feedstock supply.

We have made substantial strides forward in developing the Kinross site by combining significant private capital with grant assistance from both the State of Michigan and the United States Department of Energy Office of Energy Efficiency and Renewable Energy's Biomass Program. Site acquisition and preliminary design engineering are complete. Key technology milestones are on track. Significant progress has been made on environmental and permitting processes. Letters of intent for construction and off-take agreements are in place.

The Kinross biorefinery will be located in a rural area in the Upper Peninsula of Michigan. The plant will be constructed on a site near a decommissioned U.S. Air Force base. Kinross Township is located in Chippewa County, Michigan, a sizable rural county of 2,700 square miles. At the time of the 2000 U.S. Census, Chippewa County had a population of only 38,543, while Kinross Township had a population of 5,922. The construction and operation of a cellulosic ethanol plant in this area will create jobs and develop demand for underutilized regional hardwood timber resources, providing support for the local economy within a 150 mile or greater radius. Once operational, the plant will employ an estimated 50–60 highly skilled people. According to the State of Michigan, the construction, maintenance, and operation of this facility will create approximately 450 indirect jobs, for an estimated total of 500 regional jobs created by this project over the next 5 years. After the financial success of the facility is proven at 20 million gallons of cellulosic ethanol production per year, further expansion of the facility up to 80 million gallons per year is anticipated. This future expansion will amplify the longevity of new jobs created by this activity.

Like the other cellulosic companies, we continue efforts to secure sufficient financing to complete the project. The first commercial biorefineries capable of producing 20 to 40 million gallons of cellulosic biofuel per year will cost more than $200 million to construct. These commercial scale facilities, once under operation, will lead to rapid de-risking of the technology, and open the path to significant cost reductions as operating data becomes available and larger scale plants are constructed. Securing financing for a first-of-a-kind facility is often challenging. The difficult capital market conditions over the past year and a half have made financing even tougher, particularly for commercial debt financing. Thus, continued Federal Government support is critical to keep the cellulosic fuels industry on track to meet the production mandates of the RFS and meet the promise of new jobs, less dependence on imported fuels, and enhanced national security.

Experiences With USDA and DOE Loan Guarantee Programs

The USDA and DOE loan guarantee programs could be valuable tools to help commercialize new technologies. Unfortunately, they have not, to date, proven to be the catalyst for quickly developing commercial scale cellulosic facilities.

Given the current USDA loan guarantee structure, challenging credit market climate, and new technology of cellulosic projects, banks are reluctant to provide project financing and to use the USDA loan guarantee program to fund commercial scale cellulosic ethanol projects. Earlier this year, Mascoma and its financial advisors contacted 174 commercial lenders seeking a bank partner to apply for a USDA loan guarantee for the Kinross project. We spent significant time and money on the

loan guarantee application process. Only two lenders were willing to work with us. We selected one, but in the end were unable to move forward due to structural problems with the USDA loan guarantee program requirements. Other first-mover cellulosic companies had similar experiences with their projects.

Lenders told us that they need several adjustments to the USDA loan guarantee program in order to meet their credit and pricing guidelines. For example, as the project size increases, the loan guarantee amount reduces. This discourages larger projects with more impact on jobs, climate and energy independence. Other areas that need addressing include:

- holding a minimum of 50% of the non-guaranteed portion of the loan;
- requiring identical terms for the non-guaranteed and guaranteed loan portions despite much different risk profiles; and
- limiting to 1% the difference between the interest rate on the guaranteed portion of the loan and the weighted average interest rate of the full loan amount.

In addition, we recommend several other program improvements that would improve funding prospects:

- allowing biorefinery applicants to use the Federal Financing Bank as the sponsor lender, similar to the DOE loan guarantee program;
- authorizing guarantees of a revolving credit facility for project working capital needs;
- allowing the replacement of the non-guaranteed portion of the loan with equity or subordinated debt at market rates to provide more flexibility and options in the financing structure; and
- increasing the percentage of guaranteed debt for projects over $125 million to enhance recruitment of sponsor bank support.

We are working with other industry leaders to encourage USDA to address these issues moving forward.

We appreciate this Committee's efforts to create a workable loan guarantee program at USDA and hope the Department of Energy's loan guarantee program will also evolve to eliminate present, although perhaps unintended, significant hurdles for developing commercial cellulosic ethanol facilities. In the most recent round of applications, it seems to us that DOE may have applied the same evaluation criteria for both mature and developing technologies. This has the consequence of bias in favor of mature technologies and companies *versus* new ones like advanced cellulosic fuels.

The cellulosic industry will develop as quickly as the first plants are constructed and proven. To speed the current trajectory of construction, more direct, risk-tolerant assistance will be required.

Refundable Investment Tax Credit Would Encourage Equity Investment

While not within the jurisdiction of this Committee, I want to briefly raise a concept that a coalition of several leading ethanol companies, including Mascoma, are advocating. The American Recovery and Reinvestment Act of 2009 included a provision making the Investment Tax Credit for renewable electricity generation, including wind and solar, refundable through a monetized Treasury Department grant. To date, over $1 billion has been awarded through this program to help develop renewable energy projects across the country. This mechanism is proving to be an effective and efficient means of jump-starting development of renewable electricity projects. We believe that providing a similar 30 to 40 percent refundable investment tax credit for advanced biofuels projects would be significant in helping attract private capital needed to build the next generation commercial production facilities.

As we look at the RFS2 mandated levels of advanced and cellulosic fuels in the near term, it is critical that the first wave of cellulosic ethanol facilities close their financing and begin construction as quickly as possible. Given the current constraints of the USDA and DOE loan guarantee programs, a monetized investment tax credit is one of the few policy mechanisms that can be employed in a timely manner to help ensure cellulosic ethanol production capacity comes on line in time to comply with the mandates of the RFS.

Conclusion

We, at Mascoma, very much appreciate the significant Federal support to help develop a commercial cellulosic biofuels industry. We are confident in our technology and our ability to produce cellulosic biofuels in a cost-competitive manner and appreciate the ability to leverage Federal support moving forward. From significant investment of funds in the 2008 Farm Bill's energy title for advanced biofuels, to the

expanded Renewable Fuels Standard in the 2007 Energy Bill, to the cellulosic ethanol production tax incentive, to Department of Energy's grant funding, Congress has provided important support to help this industry succeed.

However, given the current economic conditions, we will need continued Federal involvement and commitment to seeing the promise of the cellulosic industry come to fruition. I look forward to continuing to work with the Committee in that regard. Thank you.

The CHAIRMAN. Thank you.

Mr. Shealy.

STATEMENT OF L. CRAIG SHEALY, PRESIDENT, CEO, AND CO-FOUNDER, OSAGE BIO ENERGY, LLC, GLEN ALLEN, VA

Mr. SHEALY. Good afternoon. Thank you, Chairman Holden, and distinguished Members of the Subcommittee.

My name is Craig Shealy and I am the Co-Founder and President and CEO of Osage Bio Energy based in Glen Allen, Virginia. Thank you for extending us the privilege of addressing you today on the future of second and third generation biofuels. I would like to provide a brief background on Osage and discuss our positive impact on agriculture, review several key challenges that are facing Osage and the biofuels industry, and conclude with a few specific policy recommendations on these challenges.

Osage was formed in January of 2007 to build market-based ethanol plants on the East Coast. Each plant will employ proven bioprocessing technologies and carries a capital investment of approximately $200 million who will employ approximately 55 people. Our plants will be optimized around local winter barley but can also process a variety of small grain feedstock. Last fall Osage broke ground on its first plant in Hopewell, Virginia. The Hopewell plant will be operational in May 2010, and will be the only commercial scale barley-fed ethanol plant in the United States. Our process uses state of the art technologies from a number of industries to create four marketable products, 65 million gallons of motor fuel grade ethanol, approximately 50,000 tons of renewable biomass fuel pellets made from the barley hulls, 170,000 tons per year of barley protein meal, actually an offset for soybean meal, and 150,000 tons per year of food grade liquid CO_2.

Osage is a deployment and operations company. While other companies work on developing tomorrow's second and third generation technologies, our goal is to deploy the best technology available and incorporate it into a commercial scale operating plant. We look forward to the successes of our technology counterparts, hoping that someday very soon we will have the opportunity to bring their technologies to commercial scale reality as well.

Each Osage barley project will create an immediate annual market for 300,000 acres of winter barley. These acres will come from relatively under-utilized winter acres, many of which are left fallow before a full-season soybean crop. This translates into a truly new incremental $100 million annual revenue opportunity for the local farming community around each of our plants. Many of these farmers also responding to this opportunity, particularly around Hopewell are located in the Chesapeake Bay Watershed. Winter crops, especially barley are promoted in the watershed as common and accepted soil and water conversation practice, and the Chesapeake Bay Commission has spoken out publicly in support of our project.

The use of barley as a feedstock contributes to positive and accepted land use practices and actually avoids indirect land use change. The bottom line is our projects have positive land use effects and avoid negative implications associated currently with ILUC, and keep farmers on the farm.

The challenges we face in the industry as a whole we can enumerate in several key areas. The first as has been mentioned before, there is a complete absence of financial market liquidity for future projects. We are actually having to finance our first project out of 100 percent equity. There is currently an inability in the industry because of this to meet the RFS2 advanced biofuel carve out. Furthermore, there is a great market uncertainty as has been referenced by my colleagues here on the panel due to the E10 blend wall. The reality is that maintaining this cap will have the impact of rendering second and third generation advancements meaningless as there will be no market driven reason to deploy them. Additionally, the declining value and pending elimination or expiration of the blenders tax credit is also forcing great uncertainty into the industry.

Existing Federal programs that could bridge the financial downturn are either too restrictive or too structured around specific technologies and exclude commercial scale biofuel projects from eligibility. One example is of the recent DOE loan guarantee program which is very specific around renewable electricity, and the other that has also been referenced here is the USDA Biorefinery Assistance Program. Our view of that program can be summed up as such, in good times you don't need it because the banks will provide the capital. In bad times you can't use it because the banks want to take zero risk on the industry, and, in particular, that is what we see at the moment. In addition, RFS2 represents another policy area with significant implications in the industry and in an attempt to overcompensate for the lack of sound science on lifecycle emissions impact to biofuels, RFS2 over complicates the rules that govern biofuel markets. Specific examples of this include the RFS2's feedstock certification requirement as well as much of everything involved around the indirect land use change. In addition, we feel strongly that advanced biofuel designation should be performance-based, not policy-based. Therefore, developers of second and third generation technologies need a level playing field with the entire spectrum of feedstock and conversion processes at their disposal. Now, RFS2 seeks to unnecessarily stovepipe these into a complex matrix of fuel pathways, each with their own unique challenges and validation requirements.

In conclusion we recommend the following policy actions. First, we have to raise the E10 volume cap through an EPA grant of an E15 waiver or at a minimum an intermediate E12 waiver. We have to extend the blenders tax credit, and we have to revise Federal loan and grant programs to make them more widely accessible and applicable, and finally we have to simplify the RFS2 by removing ILUC requirements and making it a performance-based advanced biofuel status. Osage Bio Energy can build high performance commercial scale advanced biofuel plants today and we are, and we stand ready to deploy second and third generation technologies as they emerge from development and demonstration phases.

Thank you very much for the opportunity to talk to you today.
[The prepared statement of Mr. Shealy follows:]

PREPARED STATEMENT OF L. CRAIG SHEALY, PRESIDENT, CEO, AND CO-FOUNDER, OSAGE BIO ENERGY, LLC, GLEN ALLEN, VA

October 29, 2009

U.S. House of Representatives,
Committee on Agriculture,
Subcommittee on Conservation, Credit, Energy, and Research,
Washington, D.C.

RE: Testimony of Craig Shealy, Osage Bio Energy, LLC

Ladies and Gentlemen,

Good morning. My name is Craig Shealy, and I am the founder, President, and CEO of Osage Bio Energy. Thank you for extending me the privilege of addressing you today on the future of second and third generation biofuels. I would like to provide a brief background on Osage Bio Energy, discuss our positive impact on agriculture, review several key challenges facing Osage and the biofuels industry, and conclude with policy recommendations on facing these challenges.

1. Company

Osage was formed in January 2007 to build market-based ethanol plants on the East Coast. Each plant will employ proven bio-processing technologies and carries a capital investment of approximately $200 million.

Our plants will be optimized around local, winter barley, but can also process a variety of small grain feedstock. Last fall, Osage broke ground on its first plant in Hopewell, Virginia. The Hopewell plant will be operational in May 2010 and will be the only commercial scale, barley-fed ethanol plant in the United States. Our business model is to develop at least two more similar facilities.

Our process uses state-of-the-art technologies from a number of industries, the most important example being in grain processing. Incorporating advanced food processing technology, our milling and fractionation of barley grain allows us to efficiently process the independent grain fractions into high quality product and co-product streams. It also allows us to capture the exceptional protein profile found in barley, and our specialized processing and drying methods preserve this in a high quality livestock meal product.

We have engineered and packaged these technologies into a unique bio-products plant that will create four highly marketable products:

- 65 million gallons per year of fuel grade ethanol;
- 50,000 tons per year of renewable biomass fuel pellets from barley hulls;
- 170,000 tons per year of Barley Protein Meal; and
- 150,000 tons per year of food-grade liquid CO_2.

Osage is a deployment company, which distinguishes us from other biofuel companies you are hearing from today. While other companies work on developing tomorrow's 2nd and 3rd generation technologies, our niche is finding the best that is out there and incorporating it into the engineering, design, and construction of an operating plant. We look forward to the successes of our technology counterparts, hoping that someday soon we will have the opportunity to bring their platform into commercial scale reality.

2. Agricultural benefits

Each Osage project will create an immediate annual market of 300,000 acres of winter barley. These acres will come from underutilized winter acres, many of them followed by a full-season soybean crop. Winter barley is harvested early enough to allow full-season beans to follow, providing an ideal double-crop opportunity. This translates into an additional cash crop, with a $100 million annual revenue opportunity for the local farming community.

Many of the farmers responding to this opportunity for our Hopewell, Virginia plant are located in the Chesapeake Bay Watershed. Winter crops are promoted in the watershed as a common and accepted soil and water conservation practice. As a winter crop, barley will capture remnant nutrients left in soils after the fall crop harvest, reducing non-point-source nutrient runoff. The Chesapeake Bay Commission has gone on record endorsing our project as a "generation 1.5 biofuel" serving as an "important stepping stone" toward cellulosic ethanol. The use of barley as a

feedstock contributes to very positive and accepted land use practices and ***avoids indirect land use change.*** Furthermore, barley hulls and barley straw have been identified as attractive cellulosic feedstock options. Our access to this resource provides us valuable and abundant raw materials for our entry into 2nd and 3rd generation plant deployment.

According to the most recent Ag Census statistics, Virginia, alone, lost more than 100,000 acres of farmland per year over the 5 year Census period. Because winter barley utilizes otherwise idle cropland, equipment, and manpower, it can be grown with minimal investment by the farmer. Coupled with a clear revenue stream, this may be just what is needed to reverse the trend of declining farmland acres. Let's not let concrete become the last crop. Bottom line: our projects have positive land use effects, avoid negative implications associated with ILUC, and keep farmers on the farm.

3. Challenges

The biofuels industry, as a whole, is challenged on a number of fronts:

- Absence of financial market liquidity—Growth opportunities are limited to small, privately funded research and demonstration activities.
- Inability to meet the RFS2 advanced biofuel carve-out—Osage is poised to develop additional commercial scale projects that will meet the greenhouse gas performance standards of advanced biofuels and can be part of the solution to this problem.
- Industry myths and bad press—As the result of efforts of certain advocacy groups and much of the media, biofuels have been given a bad name. Some of the misinformation leads the public to believe that biofuels have negative greenhouse gas impacts and are the culprit for high food prices. To those of us in the industry, the spread of these clear falsities is damaging.
- Market uncertainty—The E10 blend wall represents an industry volume cap and limits growth opportunity and how far ethanol can go in helping to displace imported oil. Maintaining this cap will have the impact of rendering 2nd and 3rd generation advancements meaningless as there will be no market driven reason to deploy them. Additionally, the declining value and pending elimination or expiration of the blenders tax credit (VEETC) is forcing the industry in the direction of increased uncertainty.

4. Policy Issues and Recommendations to Face Challenges

Existing Federal programs that could bridge the financial downturn are either too restrictive or too structured around specific technologies, excluding commercial scale biofuels projects from eligibility. An example of technology eligibility limitations is the recently announced DOE Loan Guarantee program for commercial technologies. This program is structured around renewable electricity technologies, such as solar and wind, and excludes biofuels from eligibility. In fact, it appears to us that DOE is abandoning alternative fuels altogether in pursuit of hybrid and battery/electric technologies.

As an example of being overly restrictive, I offer the USDA Biorefinery Assistance Program. Osage has spent considerable time in researching and trying to apply this program to our projects. Our conclusion is this: In good times, you don't need it; in bad times, you can't use it. Even in these bad times, Osage stands ready to commit $100 million of equity toward a second project. In order to proceed, we need $100 million of debt. A 70% BAP loan guarantee of $70 million doesn't help, because no bank will take the risk on the remaining $30 million. In working closely with exciting partnering opportunities in South Carolina, Kentucky and Pennsylvania, one approach considered was for the state to backstop and guarantee a loan on the remaining $30 million. Unfortunately, the BAP program restricts this, eliminating it as an option. In short, the program doesn't work because of a single and rather simple program restriction. (*Congressman Holden and Mr. Chair . . .*), we have been working closely with Lancaster Biofuels on their pursuit of a barley-based plant in Lancaster, Pennsylvania. Osage is their partner of choice in deploying this project. If we could eliminate or waive this one restriction, it could be the single most important thing to get us started on our next project.

The RFS2 represents another policy area with significant implications on the industry. In an attempt to overcompensate for the lack of sound science on the lifecycle emissions impact of biofuels, the RFS2 seeks to overcomplicate the rules that will govern biofuel markets. An example is the RFS2 feedstock certification requirement. The rule seeks to have all shipments of biofuel feedstock certified to ensure it was produced from croplands in existence prior to December 19, 2007. The purpose of this is to help prevent the creation of new bioenergy crop acres through

deforestation practices. With no sound science to quantify or confirm this, we view this as an unnecessary administrative burden that will add cost layers and complexity, with no true benefit. Osage feedstock in particular will be sourced from legacy farms, many in existence prior to 1807, much less 2007. In fact, one participating farm, only 8 miles from our Hopewell, VA plant, was founded in 1638. With Renewable Electricity Portfolio standards requiring no such certification, biofuels will be placed at a disadvantage. Oil companies that bristle at the recent suggestion of requiring certification of crude oil country of origin provide a stark reminder of the lack of subsidy and regulatory parity within the fuel industry.

The Osage business model is based on the opportunities associated with advanced biofuel designation, and we feel strongly that this designation should be performance based, not policy based. Osage is a member of the Advanced Biofuels Association, and we agree with the platform that biofuel-related policies and regulations need to be technology neutral, feedstock neutral, and subsidy neutral. Developers of 2nd and 3rd generation products need a level playing field with the entire spectrum of feedstock and conversion processes at their disposal. The RFS2 seeks to unnecessarily stove-pipe these into a complex matrix of fuel pathways, each with their own unique challenges and validation requirements. The intent of facilitating renewable fuels has been completely lost in a policy driven, regulatory complex conundrum.

In conclusion, we recommend the following policy actions:

- In order to develop market certainty, raise the E10 volume cap through the EPA grant of an E15 waiver, or at a minimum an intermediate E12 waiver. This will provide a market reason for companies such as Osage to invest and expand into the 2nd and 3rd generation space.
- In order to develop market certainty, extend the blenders tax credit.
- In order to bridge financial market downturns, revise selected Federal programs to make them accessible and applicable to existing commercial scale biofuels technologies.
- In order to facilitate biofuels in the marketplace, simplify the RFS2. As written, proposed rules do more to impede advancement. The complexity of the rules will delay growth and add cost layers to an industry already burdened with thin margins and uncertain economics.

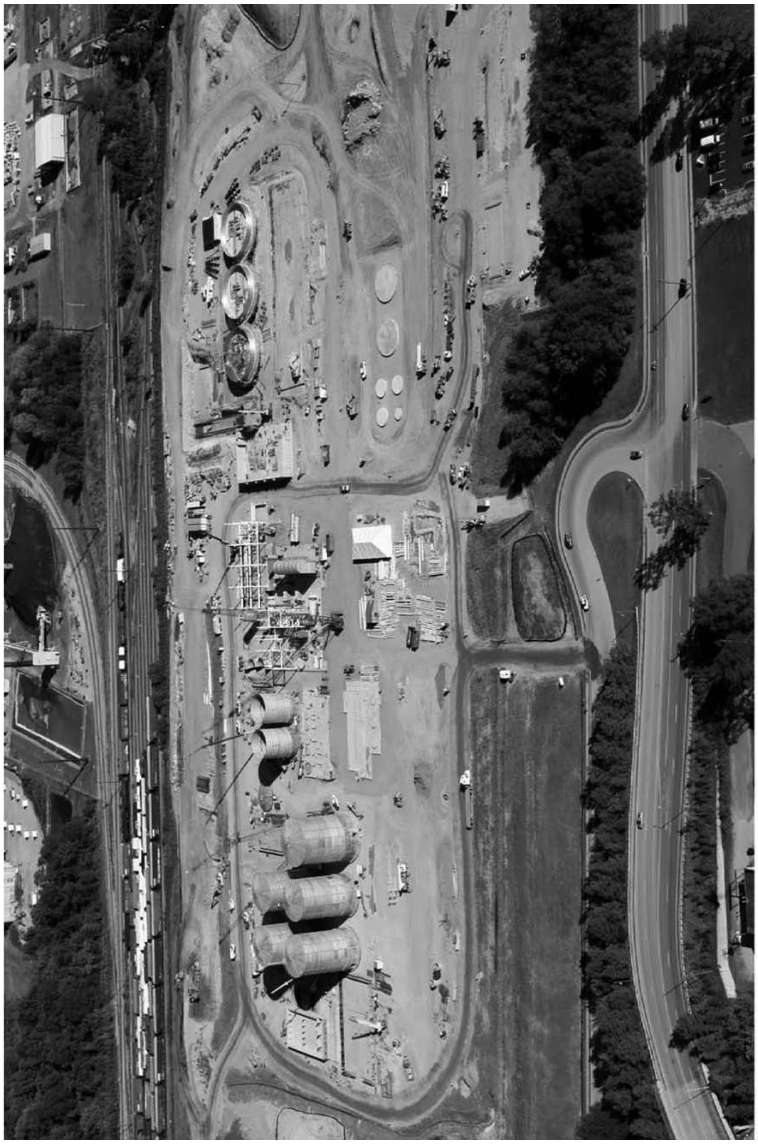
To be clear, Osage Bio Energy can build high performance, commercial scale advanced biofuels plants ***today,*** standing ready to deploy 2nd and 3rd generation technologies as they emerge from development and demonstration phases.

Ladies and gentlemen, that concludes the testimony of Osage Bio Energy. We sincerely thank you for the opportunity to stand before you today.

Very truly yours,

Osage Bio Energy, LLC
L. CRAIG SHEALY.

ATTACHMENT


OSAGE BIO ENERGY
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The CHAIRMAN. Thank you.

Mr. Jamerson, thank you for your comments about the problems you see with the loan guarantee program. I hope you had a chance to talk to Mr. Tonsager about that.

Mr. JAMERSON. We did.

The CHAIRMAN. Okay, well we will follow up with that as well and, Mr. Roe, you are absolutely right about different and conflicting definitions. Now, this Committee has worked very hard since H.R. 6 was passed, without any input from this Committee, to change that definition. We are still trying, with an energy bill moving now, but if we are unsuccessful in getting the law changed, how will this impact the future of investment in biofuels, for anyone on the panel.

Mr. JAMERSON. Well, first of all there is a lot of chatter around, and rightfully so, around the emerging technology platforms but ultimately, these technologies will get legs or they won't and at a point this all becomes a feedstock game. It is very much a feedstock game, so I listened with great interest to our friends from the USDA this morning talk a little bit about feedstocks, where they are going to come from and their ultimate development. Ultimately, all of the rhetoric around the commercialization of processes and technologies is hollow unless the definition of the feedstocks is clean and clear, and the way is paved for the utilization of those in some sort of a planned fashion.

The CHAIRMAN. Anyone else care to comment?

Mr. SHEALY. If I may, our view very strongly is that there needs to be, again, a very performance-based approach where we model the true GHG impact of any given feedstock and actually create an environment. One which does not overly specify a specific pathway, which is what the current situation is with respect to several of the legislative remedies mentioned here, as well as the RFS2 implementation process.

The CHAIRMAN. Anyone else? No.

Mr. Roe, your plant in Pennsylvania, it is in southwestern Pennsylvania, correct?

Mr. ROE. It is just about an hour or so outside of Pittsburgh, south and a little bit east actually.

The CHAIRMAN. Okay, and what made you choose that location?

Mr. ROE. A variety of things we have had, we find the Commonwealth to be a place that is friendly as far as its outlook on energy in general. We have a technology partner that is located in the near vicinity that made it convenient for us to come there as well, but a whole variety of things caused us to go there.

The CHAIRMAN. And are you saying you are just in design or are you in construction there?

Mr. ROE. No, that demonstration facility is complete and now in operation. We have been running now, we commissioned it back in July and it is in operation, and we needed that facility essentially to confirm the final design parameters on the full scale plant that we have designed.

The CHAIRMAN. Okay and what affect has that had on the local economy, if you know?

Mr. ROE. Probably very little in that we kind of broke ranks here in that we decided to build this facility, we decided to build the

smallest facility that we could possibly build that would still scale to 50 million and 100 million gallon a year type facilities. So essentially we have added maybe 14 or 15 jobs in terms of full-time jobs to operate that small facility in Pennsylvania.

The CHAIRMAN. Okay, thank you.

And finally, for all the panelists, what are each of you doing to engage the agriculture community, and what efforts are you making to talk to farmers as you proceed with the next generation biofuels?

Mr. SHEALY. Well, if I may just start. That is really the core bread and butter of our business. We were with farmers yesterday, today, the day before and tomorrow we have an active contracting program on our energy crop program around the winter barley in the mid-Atlantic. So, we have, I would say, daily conversations with the whole farming community in our region.

Ms. ELLERBUSCH. On BP's side with our partner, Verenium and our facility in Highlands County, Florida we have a partnership with Lykes Brothers, who are one of the largest landowners in Florida and they are our farming partner there. We have a 20 year land lease and are in conversations around growing contracts with them, so we work on a regular basis with them. We are, as we are looking for our second facility, we are in conversations with multiple landowners elsewhere in the U.S. Gulf Coast. We, as BP, are beginning to work with farmers and landowners to understand where we can explore opportunities to develop different varieties and propagate those varieties to be able to establish product facilities, going forward. And we have begun working with the USDA on programs as well that could help in terms of understanding the genetics and development of further feedstocks.

The CHAIRMAN. Anyone else?

Mr. JAMERSON. I would say for our first commercial plant we are using pulpwood, excess wood material and we are not talking to farmers. We are talking to landowners, timber owners, also to an environmental group to help us develop sustainable standards. We use, essentially, the branches after others use the main stem of the tree, and so we are very active on a weekly basis meeting and talking to people about that.

The CHAIRMAN. Thank you.

The chair recognizes the gentleman from Virginia.

Mr. GOODLATTE. Thank you, Mr. Chairman.

Ms. Rosenthal, I understand the U.S. Navy for the first time ever is purchasing renewable fuels derived from algae for testing and certification, and that the volumes provided under these contracts are over 20,000 gallons of the type of diesel fuel for Navy ships and 1,500 gallons for jet fuel. It sounds to me like this is the real first step toward commercialization. What can you tell us about this technology that is being used to produce these volumes?

Ms. ROSENTHAL. That is one of our member companies and is actually producing those using algae for these jet fuels and for Navy requirements. Unfortunately, I cannot tell you as much as I would like to about the specific technology because it is proprietary, however, it was a great step in the right direction as far as real commercialization from one of our member companies.

Mr. GOODLATTE. And do you think this is likely to lead to a steady contract, be able to actually, I mean, Navy ships require huge quantities of fuel. Do you think this can be scaled up to the level that would accomplish this?

Ms. ROSENTHAL. The availability is an opportunity. It is probably 1 to 2 years out before we are fully scaled and to a commercialized industry, however there is opportunity for us to do so with our selected member companies. Being an industry trade association, I can't speak to specific organizations. I have to speak to my membership.

Mr. GOODLATTE. Sure, but whether you think it is available?

Ms. ROSENTHAL. Yes, the ability is there.

Mr. GOODLATTE. We have heard about many obstacles that must be overcome before we see large-scale commercial production of advanced biofuels, whether it be policy, research, or financing. In your opinion, what is the biggest hurdle facing commercialization of second and third generation biofuels, and I will just go right down the line. I will start at the other end, Mr. Shealy.

Mr. SHEALY. I would say the biggest hurdle today is market driven with respect to the uncertainty around the blend wall as it relates to the only really large scale commercial biofuel, renewable fuel we have in this country which is ethanol. We need to have some clarity in that and that is for both second and third generation, as well as the first generation technologies. We have to have some market certainty. I think that is probably the single most critical thing if I had to pick one that we have to get resolved is the blend wall issue.

Mr. GOODLATTE. And explain that a little, if you could.

Mr. SHEALY. Well, the current situation is we have an arbitrary cap of a ten percent blend with respect to EPA's lines of E10. The only way that RFS is going to be met, even in as soon as 2010, is we have to have a waiver to get to E12. So that is creating—there is no reason to build any second and third generation plants at this stage of the game until there is greater market certainty around that demand and the ability to blend at those higher levels.

Mr. GOODLATTE. So you don't think these products can stand on their own and sell in the marketplace because there obviously are a lot of controversies surrounding raising those limits. We have heard from a number, I have and I am sure others here have as well about various types of machinery not functioning properly the higher the ethanol percentage is. Do second and third generation fuels take care of that problem? Would that be a replacement for it that would eliminate that kind of uncertainty in the marketplace?

Mr. SHEALY. Well, I mean if you had fuels ready to deploy which truly were a direct offset to gasoline and diesel fuel, the reality is while there may be some very promising, those were discussed in the last panel as being classified as sort of third generation according to Dr. Shah. If you had those that could replace directly gasoline and diesel then perhaps that would be the case. However, today the issue holding back the use of greater ethanol is an allowance to blend at a higher level, and so it is not even a market driven decision. The EPA simply doesn't allow a blend.

Mr. GOODLATTE. Are we talking about corn-based ethanol or are we talking about something else?

Mr. SHEALY. It doesn't matter what type of ethanol, how the ethanol is produced. There is no reason to blend at a higher level whether it is corn-based ethanol or whether it is what you might call a second generation fuel, *i.e.,* what both Mascoma and Coskata are doing where you are producing ethanol from biomass, there is no reason to build one of their plants today if you don't have any, you can't blend past the current limit. We can meet ten percent roughly, or very close to it, based on the corn-based ethanol capacity that is out there today.

Mr. GOODLATTE. Mr. Jamerson.

Mr. JAMERSON. Yes, so I would say the biggest challenge is financing. Debt capital is just plain not available without a loan guarantee. It is just not there and equity investors really don't want to put in 100 percent equity at these plants. They need to have a leverage return to make their IRRs look good and so I think that is a big hurdle. I truly believe that if we can get loan guarantees opened up, and also this investment tax credit, that there will be plenty of equity for these plants. So I do share some of my colleagues concerns about the blend wall, but I think that with the RFS2 which mandates cellulosic fuels, I think you will see further acceptance of the cellulosic component if you will, in the marketplace. So, I am maybe a little less concerned about that but the financing is a big thing.

Mr. GOODLATTE. Mr. Roe.

Mr. ROE. I will save your time. Ditto. It for us is exactly the same issue. It is the hurdle that we have in front of us that we can't seem to figure out how to jump is how do we get this first plant up and built. Now, I am an optimist and I believe once the first one, the first 50 or 100 million gallon plant that we build, the doors are going to swing open for financing of future ones and we won't need anymore help, but getting that first one up is nigh on impossible in this environment right now.

Mr. GOODLATTE. Yes, now are you going to produce a fuel that stands independent or has to be blended with gasoline?

Mr. ROE. Well, we are producing ethanol and so we have the same types of market restrictions as some of the other folks have discussed here in terms of the blend wall and that type of thing, but I am confident that we can overcome that.

Mr. GOODLATTE. And what do you have to say about those who say that machinery has to be retooled? Are you going to see more flex-fuel vehicles or I mean I would love to have E85 pumps. I looked at buying a flex-fuel vehicle a few years ago and I went on a website that tells me where I can find E85.

Mr. ROE. Well, number one.

Mr. GOODLATTE. Well, let me finish and on that website I found that the closest one to Roanoke, there were none within a 100 mile radius and there were 20 within a 200 mile radius, but, obviously, that wasn't going to meet my needs.

Mr. ROE. Well, what you describe is real but we shouldn't consider that to be a technical challenge to figure out a way to use blend pumps and that type of thing. It is very true that there are internal combustion engines out there that aren't going to operate

well with high concentrations or even lower concentrations of ethanol. I would not deny that but for the current automobile fleet, we can all burn at least ten percent and science is there for 15 percent.

Mr. GOODLATTE. Right, I understand the interest in mandates. I am much more of a free market guy. In Brazil, they have flex-fuel vehicles almost universally available and the consumer knows how to do the computation based on you get less miles per gallon perhaps.

Mr. ROE. Right.

Mr. GOODLATTE. But how to do the computation whether they are better off with the E85 or whether they are better off with gasoline and they switch back and forth.

Mr. ROE. Exactly.

Mr. GOODLATTE. I would love to see that develop in our marketplace and I would bet you would, too.

Mr. ROE. So would we.

Mr. GOODLATTE. How do we do it?

Mr. ROE. Well, you tear a page out of Brazil's book. I mean it was clear what they did. They did it, essentially, through a government mandate.

Mr. GOODLATTE. In what respect?

Mr. ROE. Well, first of all they basically worked at this for a number of years and didn't give up. It wasn't an overnight success in Brazil. It was 20+ years in the making, but over that period of time with the production of the fuel and the introduction of automobiles that could burn that fuel they were able to do this. But, it took a government definition and a government mandate to get there.

Mr. GOODLATTE. But what was the mandate?

Mr. SHEALY. They mandated flexible fuel vehicles. Every vehicle in Brazil is a flexible fuel vehicle.

Mr. GOODLATTE. Okay, the car companies have been pretty forthcoming in saying they would love to build them. I know of companies that manufacture cars that work with entities like Wal-Mart and Sam's Club and say look if you put an E85 pump at a particular location, we will notify everybody in that area who has a flex-fuel vehicle that they can find that fuel at these locations in that area. So, the car companies are on board with wanting to make flex fuel vehicles, I don't think that is the problem.

Mr. ROE. Even before the issues of last year, General Motors committed to having 50 percent of their models flex-fuel capable within the very, very foreseeable future, single digit years and they are on that track, as you know.

Mr. GOODLATTE. Right, good.

Ms. Ellerbusch.

Ms. ELLERBUSCH. So in terms of the challenges, I would echo what Mascoma and Coskata are indicating are financial challenges. I think the financing industry has essentially been closed down, and without this financing you cannot bring commercial facilities to bear and also continue to support the continued development we need on technology. We need stability in the policy and regulatory support frameworks that we have today to make those investors believe that they can invest in this industry and feel like they will

be able to get some return for their investment. So banks won't come into this base because they are concerned about what they saw happen on corn ethanol, and they are concerned that the technology risk that sits in cellulosics and other advanced biofuels is too great for them to risk their money. And second, for us, we see that feedstock support is critical. Right now, if you look at our facility we are building in Highlands County, Florida, we are using energy cane. There are only a few varieties of energy cane available anywhere in the U.S. Nobody in Brazil builds facilities without less than a dozen types of varieties of sugarcane because of the issues you may have with crop failure. So, we have an industry that is trying to form around perennial energy crops with almost no variety development that has been done. So to get to this scale around development we are going to have to work with USDA, farmers, seed companies, other developers in this region to be able to develop feedstocks to go forward to make success happen in this industry.

Mr. GOODLATTE. Well, thank you, Mr. Chairman. I know I have vastly exceeded my time. Since I am the only one on this side maybe that is no real problem.

The CHAIRMAN. The gentlewoman from Pennsylvania.

Mrs. DAHLKEMPER. Thank you, Mr. Chairman. Thank you for this important hearing. Thank you for the, thank you to the witnesses for coming forward.

I have a number of different questions. First of all, do any of you have a biodiesel plant? You are all ethanol-based, right, okay, just wondering about that.

Ms. Rosenthal, I actually watched a very interesting documentary the other day called *FUEL*, have you seen it?

Ms. ROSENTHAL. I have not seen it yet.

Mrs. DAHLKEMPER. Very interesting and in anyway I would recommend people watch it. It talks a lot about the diesel engine actually, and from that film and just thinking about the rest of the world, where do you see we are here in the United States in terms of respect to our development, whether we are talking about biodiesel or ethanol in terms of any kind of biofuel? Where are we? Are we falling behind? Are we equal with other parts of the world? Where do you see the United States is in terms of development of these alternative fuels?

Ms. ROSENTHAL. I can only specifically talk about algae, but I see a lot of development in China, India, in Europe with the algae community and what they are doing with both biodiesel and other jet fuels. Do I feel like we are falling behind? Absolutely not. We have had more investment here in the last year, close to $1 billion of private investment into the algae community with a variety of different stakeholders that I represent with my trade organization. Our key is just making sure algae is treated equally to other fuels, that we get financial parity as far as the same tax incentives, subsidies with other renewable fuels as well as.

Mrs. DAHLKEMPER. Well, on that specific question. Can you give me an idea of, or can you give me the specific definition of *algae*, where that falls because that was one thing that you brought up. I wanted to ask you about that. Can you explain where algae falls in that definition and why there is an issue with that?

Ms. ROSENTHAL. I cannot.

Mrs. DAHLKEMPER. Okay. I didn't mean to cut you off.

Ms. ROSENTHAL. No, that is okay. I will just be very, very candid. I am relatively new into this role and I don't have the science behind me to do that.

Mrs. DAHLKEMPER. Okay, if somebody could get that information to me.

Ms. ROSENTHAL. I can get that information to you.

Mrs. DAHLKEMPER. Does anyone else want to address where we are compared to the rest of the world at this point?

Ms. ELLERBUSCH. I will comment. I think the Energy Independence and Security Act of 2007, really was a catalyst to take the U.S., potentially, to the forefront of advanced biofuels. In BP, we were looking at advanced biofuels through kind of a long term technology partnership with universities here that we have called Energy Bio Sciences Institute. When we saw the EISA form in 2007, it catalyzed us to become a major investor now, and I think we have realized through our efforts around the globe that the U.S., on the technology side, on things like cellulosics is well-advanced to others. We have the opportunity in the U.S. to actually be at the forefront and be the first to make a material, scalable business in cellulosics here. So I do think we are different here in the U.S.

Mrs. DAHLKEMPER. I have a question for those with first generation ethanol plants. Tell me what the difficulty is in converting that to second and third generation feedstocks, because I know I have a biodiesel plant in my district. They designed the plant to be able to take many feedstocks and actually they are one of the few biodiesel plants that is actually up and running today. If this is one of the issues with your plants, if somebody could address that, I would appreciate it.

Mr. SHEALY. I think I am probably the closest one. We are, we kind of consider ourselves as generation 1.5. We actually ferment grain-based starch, which means that we don't have any corn-based plants, but we are building a barley-based plant which is fundamentally very similar technology-wise. What I would tell you is, I think it actually has a great opportunity to have a bridge into these new feedstocks, and let me give you a couple examples that we are working on. With barley in particular, you create a decent amount of straw which is incremental straw that wouldn't have otherwise have been available on the ground which could be collected and used as a cellulosic feedstock. Also, we create a byproduct essentially from the hulls of the barley which we currently turn into a renewable biomass fuel pellet, which is co-fired with coal or potentially shipped to Europe because there is a big demand over there for that. We see those as two great cellulosic feedstocks as potential to and with cellulosic technology from one of the, potentially one of the folks sitting beside me here or others in this space as well. I think very similar situations are out there and opportunities in the corn space where you have the cob, you have the stover and there are certain pieces of the back end of the plant, if you will, that can be leveraged to multiple technologies, specifically distillation and dehydration of the ethanol.

Mrs. DAHLKEMPER. Okay.

Ms. ROSENTHAL. I wanted to add one element so we are working on technology, butanol with DuPont, and actually that is a technology that will give us an advanced molecule that can be retrofitted, actually we call it the software change, into existing corn ethanol facilities and any other grain-based facilities today. So for a small capital investment we can take today's ethanol facilities and potentially make them into biobutanol facilities, and this is a molecule that can be blended in at higher rates than today's infrastructure. So, it does allow us to have an opportunity to even move through the blend wall as a transition.

Mrs. DAHLKEMPER. Okay, I have one more question, Mr. Shealy. One thing you mentioned, you said that you feel strongly that this designation should be performance-based and not policy-based.

Mr. SHEALY. Correct.

Mrs. DAHLKEMPER. And I just wanted to question you on that because I am wondering should we not look at issues in terms of clean water or clean air? Should it all be just, when you say that it should just be performance-based, that is a question I had with that statement.

Mr. SHEALY. Oh I absolutely think it should be that those things should be considered to the extent they can be quantified, and so for example with the winter barley crop that we are utilizing, it actually prevents the nutrient runoff that would otherwise occur during the winter months on land that is typically left fallow between a corn and soybean cropping system. So we target those acres and the Chesapeake Bay Foundation has actually come out in support of our project for that very issue because of the positive impact to the watershed.

Mrs. DAHLKEMPER. Well, maybe I don't understand then what you mean by performance-based, because if we are looking at policy, obviously, here. When we look at these different feedstocks we have to look at things such as water and air and things that obviously would potentially harm our society.

Mr. SHEALY. Sure.

Mrs. DAHLKEMPER. So not just performance when I think of performance, and maybe I am not understanding exactly.

Mr. SHEALY. I think performance again has to be things that you can quantify. For example, currently the indirect land use change calculation is a very arbitrary, it is a very arbitrary approach which is trying to sort of assimilate one number across the board to any type of pathway.

Mrs. DAHLKEMPER. Well, I have some issues with that, too, so I guess I don't have issues with water and air and some of those things I know we can measure.

Mr. SHEALY. Yes, if we can measure it I am fully supportive of actually trying to make if we can actually quantify and measure what a given impact is, then that is how a given pathway should be measured.

Mrs. DAHLKEMPER. But basically you are saying policy does have, should be part of this as bringing the performance.

Mr. SHEALY. What I mean is I don't think we should get overly specific with respect to the pathway, say going from one feedstock to one fuel. We need to look at, we need to have set metrics which, again, can be measured and actually tested. Then you can say okay

this particular pathway, while it may be from some type of grain starch actually has an overall greenhouse gas emissions profile which is 60 percent better than the baseline gasoline and there are not additional other land use concerns such as water, *et cetera*, that can come up. I think if you can measure and you can set real guidelines around that and really test for that, then that is exactly what we should be doing.

Ms. ROSENTHAL. If I could just interject on that, from our perspective, everything should be based on a technically neutral standard. It needs to be based on validated lifecycle assessments that are measuring the variety of different inputs and outputs of the fuel as compared with fossil fuels. It needs to be very specific to lifecycle assessments that are validated, peer reviewed and equitably measured. I have just spent 5 years in the bio-plastics industry and have been deep into LCA for several years.

Mrs. DAHLKEMPER. Well, thank you. Thank you all. My time has expired.

The CHAIRMAN. Thank you, gentlewoman, the chair recognizes the gentleman from Michigan.

Mr. SCHAUER. Thank you, Mr. Chairman.

As I am from Michigan I want to direct some of my comments to Mr. Jameson. Thank you for being here. I was in the Michigan Legislature when we enacted some of the tools that drew you to northern Michigan. I am from down south, but I am pleased that you are all here. I have two ethanol plants in my Congressional district, one biodiesel plant. The biodiesel plant is having a very, very difficult time especially right now.

Mr. Jamerson, I am assuming you located to Kinross because that is where the feedstock was?

Mr. JAMERSON. Yes, if you look at the timber feedstock in the upper peninsula there is competition over on the western side from some of the pulp and paper mills, but there isn't competition over in the eastern side of the state, or in the northern lower peninsula.

Mr. SCHAUER. Would there be adequate resources in the lower peninsula or even the southern part of the state for a plant like yours?

Mr. JAMERSON. There certainly would be. We draw a radius of 150 miles from Kinross area, and there is about 8 or 9 million tons a year of available feedstock in that area. The first phase of our plant will only use less than a half of a million tons of that excess pulpwood so there is a terrific amount of feedstock. To go lower down into the lower peninsula, we would have to work the transportation costs, but we do intend to source from the lower peninsula.

Mr. SCHAUER. I heard two themes, one blend wall, the other debt financing so again I will direct this to you, Mr. Jamerson. If the demand was there—and I will connect that to the blend wall issue—you can blend higher percentages and if the financing was there, you all, I suppose, could be very busy constructing these biofuel facilities all over the country.

Mr. JAMERSON. Absolutely, there is huge demand.

Mr. SCHAUER. Including a lot of jobs in the process.

Mr. JAMERSON. Correct, there is a huge demand for what we are doing. Right now, the financing market and then legislative uncertainty is what I would call it.

Mr. SCHAUER. Yes.

Mr. JAMERSON. It is a combination of blend wall, indirect land use, some questions on the RFS2 so investors just need to get clarification.

Mr. SCHAUER. Sure, you need that certainty.

Mr. JAMERSON. They need certainty in order to make decisions.

Mr. SCHAUER. I want to ask a quick question and I will throw this open to any of you. I am in Michigan where we make a lot of cars and do tremendous automotive R&D, best in the world. What is in your opinions, the science on the blend ratios? How is ten percent really in your opinion a low-ball arbitrary limit? What, how high could you go without GM, Ford or Chrysler or any of the transplants having to change their technology?

Mr. JAMERSON. I have been looking at this for a number of years. Before being with Mascoma I was President of Earth Energy, a corn ethanol producer and so I have been in this sector since 2001. The studies I have seen over the years show that most vehicles can run up to 15 to 20 percent without any problems on the engine. That has been a lot of independent research, universities and the like. I think the big question is liability. What if there is a problem? Who is liable, but the biggest problem is just getting the infrastructure in place getting the oil companies behind it. The car companies can make the cars. GM will have in a couple of years 50 percent of their fleet that will be flex-fuel, but they need the distribution system. I am a big fan of E85 and I think that is also a very big driver but we don't have it.

Mr. SCHAUER. But a flex-fuel vehicle could burn E20.

Mr. JAMERSON. Absolutely.

Mr. SCHAUER. Without any problems at all, correct?

Mr. JAMERSON. Correct, correct.

Mr. SCHAUER. Do you collaborate with the car companies?

Mr. JAMERSON. Well, for our company, GM is an investor. It is also an investor in Coskata as well so we collaborate with them and talk to them. We also have an oil company, Marathon Oil that is an investor in our company and so we collaborate with them. It is going to take the technology, the production, the oil companies and the car companies all to get this together.

Mr. SCHAUER. The final question is on the financing side. What did those 172 lenders that ignored you, or said, "no," say, or did they respond?

Mr. JAMERSON. Most of them responded. Some of them didn't respond. I think the challenge was that when we went out to that market earlier this year, I mean the credit markets were just flat on their back and they just weren't doing any business of any kind, and even today it is very, very challenging. I am sure you hear this in the marketplace. The credit markets are extremely challenging.

Mr. SCHAUER. Well, Mr. Chairman, I would like to work with you and work with USDA and some of our panelists on seeing if we can provide some relief in that area. There is no question in my mind in my state, and I am sure in Pennsylvania as well, that we would be much further along in our recovery if there was greater access

to credit. I have been focusing on manufacturing but you are an industry that echoes that story. We are losing out on the creation of jobs because even with highly guaranteed credit that credit isn't flowing, so it is a burning passion of mine and I look forward to making progress on that issue.

Thank you. I yield back.

The CHAIRMAN. The Chairman looks forward to working with them. The chair also thanks our panelists for their testimony today. Under the rules of the Committee, the record of today's hearing will remain open for 10 calendar days to receive additional material and supplementary written responses from the witnesses to any question posed by a Member. This hearing of the Subcommittee on Conservation, Credit, Energy, and Research is adjourned. Thank you.

[Whereupon, at 1:00 p.m., the Subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

SUBMITTED STATEMENT BY KEVIN GRAY, PH.D., CHIEF TECHNOLOGY OFFICER, QTEROS, INC.

Chairman Holden, Ranking Member Goodlatte, and distinguished Members of the Subcommittee, I am Dr. Kevin Gray and I serve as the Chief Technology Officer for Qteros, Inc., a leading biofuels company focused on converting cellulose to ethanol. I want to thank you for the opportunity to share my thoughts and insights with you on the future of next-generation biofuels.

Qteros is a venture-backed company committed to delivering innovative process technologies for clean transportation fuels that reduce greenhouse gas emissions at a price competitive with gasoline. Our team is dedicated to producing liquid fuels to achieve a sustainable solution to the world's growing energy needs.

The Energy Independence and Security Act of 2007 (EISA) enacted on December 19, 2007, mandates the annual use of 9 billion gallons of renewable fuel in 2008, growing to 36 billion gallons by 2022, including 16 billion gallons of cellulosic biofuels. With recent ethanol prices approximately $2.50 per gallon, the cellulosic ethanol mandate translates into an addressable market of over $40 billion annually within the U.S. alone.

In addition, the Food, Conservation, and Energy Act of 2008 (FCEA), enacted on June 18, 2008, puts in place a $1.01-per-gallon production tax credit for cellulosic ethanol, as well as new forms of assistance for biorefinery development, energy crop production, and research into techniques for processing cellulosic biomass feedstocks for biofuels production.

Currently in the United States there are 201 ethanol plants using almost exclusively corn grain as the raw material (a small percentage use other grains like milo or barley). These plants have a total annual nameplate capacity of 13 billion gallons. However, there are currently no commercial scale cellulosic ethanol plants in the U.S. though the EISA mandates 100MM gal in 2010 and 250MM gal in 2011 (increasing to 16 B gallons by 2022).

One of the major reasons for delays in deployment of cellulosic biofuel plants is the poor economics of the currently proposed processes. Ethanol production involves the conversion of the feedstock (be it corn grain or biomass) into sugar and subsequent fermentation of that sugar into ethanol. The conversion into sugar is carried out by enzymes, whereas the fermentation is carried out by a microbe, for example a yeast or bacterium. The "conventional" biomass-to-ethanol processes utilize separately produced enzymes and microbes, and cost analyses have shown that one of the most expensive steps of the process is the enzymatic conversion into sugar. For example the enzyme producer Novozymes estimates today that enzymes alone contribute up to $2.25/gal, almost as much as what ethanol sells for. Once the other parts of the process are added together it is easy to see that ethanol today produced from biomass is not economical.

Certainly other biofuels can be made from sugar, including butanol and longer-chain alcohols and hydrocarbons. The longer-chain hydrocarbons may be considered more "infrastructure compatible" or "gasoline-like" than ethanol or even butanol, however the economics of production of the longer-chain molecules will be even more challenged, since it will take more sugar to produce those molecules.

The economics of a sugar-based process is determined by the cost of the sugar (*i.e.,* the original cost of the feedstock, whether biomass or corn), the cost of producing the sugar from the material, and the yield of product from the sugar. Glucose (sugar) is a 6-carbon molecule and ethanol is a 2-carbon molecule, and the chemistry is such that two molecules of ethanol are produced for every molecule of glucose consumed during fermentation (in addition to two molecules of carbon dioxide). Butanol is a 4-carbon molecule, therefore only one molecule of butanol is formed per molecule of glucose, making butanol more expensive than ethanol to produce on a pound-for-pound basis. The more gasoline- or diesel-like hydrocarbons contain upwards of 6–8-carbon atoms. Hence it will take multiple molecules of sugar to produce the longer-chain hydrocarbons and they will be even more expensive.

Until the cost of sugar comes down via more efficient processing, the economic production of sugar based hydrocarbons will always be challenged. In a sense, therefore, ethanol is in a "sweet spot" for the economic production of biofuels.

My company, Qteros is developing a process of producing ethanol from biomass that will ultimately eliminate the need for exogenously added enzyme, therefore removing the estimated $2.25 from the production costs. The company is doing this by using a microbe (known as the Q microbe™ or *Clostridium phytofermentans*) that has the ability to ***both*** break down the biomass into its component sugars ***and*** ferment those sugars into ethanol, thereby producing ethanol from biomass in a single step (known as "Consolidated BioProcessing" or CBP).

The current yields are very high (close to theoretical), though the current rates of production need to be improved to achieve industrial scale production, the current focus of our development efforts. The current status of the Qteros process is that this organism requires approximately 75% less enzyme than standard yeast in a biomass process, resulting in huge cost savings. In addition the yields of ethanol from biomass are significantly higher using the Q microbe™ as compared to yeast (81% conversion *versus* 50% conversion).

The ultimate goal of the company's efforts is to completely eliminate the need for any exogenously added enzyme.

Thank you again, for the opportunity to share my thoughts with this distinguished Subcommittee on the future of next-generation biofuels.

SUBMITTED STATEMENT BY NEAL GUTTERSON, CEO; AND GREG IKONEN, GENERAL COUNSEL, MENDEL BIOTECHNOLOGY, INC.

Mendel Biotechnology, Inc. appreciates the opportunity to submit written testimony regarding the opportunities and challenges in the advanced biofuels industry. We believe that biofuels produced from purpose-grown energy crops, like perennial grasses, provide a compelling means of helping to reduce our country's energy dependence on foreign sources, while maintaining and improving overall environmental health of our landscape.

Mendel Overview

Mendel was founded in 1997 as a plant science-based technology company, focused on genomics and biotechnology for plant improvement. Mendel has collaborated with Monsanto for 12 years developing a deep understanding of plant gene expression and regulatory pathways to create traits for improvement of Monsanto's leading seed products, particularly for corn and soybean. Mendel has more recently emerged as a leading developer of purpose-grown energy crops for the production of renewable power and transportation fuel, leveraging its understanding and expertise in plant expression, and use of state-of-the-art molecular biology and genomic tools to create improved plant varieties, both conventional and biotech. In 2007 Mendel partnered with BP, a leader in renewable fuel research and production, to develop new purpose grown energy crop varieties.

Mendel's crops—high-yielding perennial grasses like Miscanthus and high biomass sorghum—can be grown on marginal or underutilized lands, require minimal water and other inputs, and yield significant greenhouse gas emission reductions compared to other renewable biomass sources. Biofuels produced from Mendel's renewable feedstocks can be a major contributor to a more secure and sustainable energy future. By appropriately mobilizing the agricultural sector, we can help meet America's need for a sustainable bioenergy supply that substantially improves energy security while providing a broad-based economic opportunity.

Government incentives established the first generation biofuels industry

Congress' passage of the Energy Independence and Security Act of 2007 (EISA) provided necessary incentives to 2nd generation biofuels producers to develop the first commercial scale quantities of biofuels derived from cellulosic sources. EISA required that an increasing percentage of the renewable fuel mandates come from advanced biofuels, and specifically cellulosic fuels, to encourage development of biofuels from these nonfood feedstocks.

The current Renewable Fuel Standard (RFS) mandates in EISA require production of 36 billion gallons of biofuels by 2022, of which 15 billion gallons must be from cellulosic sources. This production will require more than 150 million tons of biomass. Further biomass demand exists in the power sector, as power utilities are sourcing biomass for co-firing in existing coal-fired generators, as well as building new dedicated renewable power plants. The combined growth of the biofuels and biopower industries will drive demand substantially over the next 2 decades, which could require as much as 800 million tons by 2030. This level of biomass production would support substantial quantities of renewable electrical power generation *and* up to 30% of America's liquid transportation fuel requirements.

Dedicated energy crops can meet biomass need

As the interest and potential of biofuels has increased, questions have arisen over greenhouse gas emissions, land use conversion, and diversion of food to fuel. These issues are part of a broader theme of sustainability: if 30% of our country's liquid transportation fuel in future years is to come from biofuels, these feedstocks will have to be produced in a sustainable fashion. And while corn stover and timber residues will be part of the solution, meeting these targets will require purpose-grown,

perennial energy crops—crops like the C4 grasses switchgrass and Miscanthus, and woody crops, such as poplar, eucalyptus, and willow. These energy crops can be produced on less productive land, like hay or pasture land, and can yield carbon negative energy given their low fertilizer and other input needs. This represents a unique opportunity for energy production while reducing atmospheric carbon, in contrast with other carbon neutral energy sources.

Much modeling of future landscape conversion is being done at projected yields of 5 dry tons/acre, based on historic data that is being replaced now with more recent figures from academic institutions and field trials by companies like Mendel. Fast-growing, perennial grasses like Miscanthus have yields more than double these projected levels, and we are confident that with targeted development of feedstocks and focused breeding efforts, these yields will exceed 15 dry tons/acre over the next decade.

In this decade, the Federal Government has committed more than $2 billion to support the development and deployment of biorefineries to produce ethanol from biomass as a cornerstone of the renewable fuel effort. The goal of this funding has been to accelerate development of a renewable fuels market that is competitive with fossil fuels by the end of the next decade. These funds, however, have focused on downstream activities, like development and improvement of conversion technologies, and loan guarantees for new biofuels refineries. Less than 6% of DOE funding dollars have targeted upstream activities, like development of feedstocks and their supply chains.

To meet EISA's advanced biofuels and cellulosic biofuels targets and to ensure that we are positioned to reap the benefits of the government's significant investment in downstream technologies and refineries, we must devote attention and resources to development of consistent, sustainable production of renewable feedstocks. This effort will require targeted breeding of new feedstock varieties, and significant trialing to test different energy crops and varieties of these crops, produced in different regions, and converted with different processes, to ensure efficiency of biofuel production despite disparate crops, varieties and production practices.

These purpose-grown energy crop varieties do not exist today in commercial form, but are in development by leading feedstock providers. Mendel and other companies are working to develop varieties that are higher yielding, climatically adapted to different growing regions across the U.S., and that can be optimized for its ultimate purpose—whether conversion to transportation fuel or co-fired for production of electricity—to have compositional characteristics best suited for greatest extracted energy value per pound of feedstock.

Supply chain development and feedstock development are two key needs

Biorefineries and renewable power generators need consistent and reliable supplies of biomass produced in a way that refining processes or systems for burning for power are most able to utilize. Purpose-grown, perennial energy crops are ideally suited to meet these biomass demand needs in a well-structured supply chain. However, in contrast to the well-developed supply chains for commodity crops such as corn and soybean, the supply chain for cellulosic biomass has not been established. Neither has the promise of high-yields from these crops nor their regional adaptation with appropriate yields and utility for particular energy conversion processes been established. Research and field studies in target regions across the United States are needed to validate industry's projections of high yields in these regions that would maximize GHG emission reduction benefit while minimizing land requirements.

Current legislation and policies should be continued

BCAP

The public-private partnership efforts should coordinate with existing regulatory and legislative efforts, including the Biomass Crop Assistance Program (BCAP) established in the 2008 Farm Bill. USDA is finalizing its proposed rulemaking for BCAP, and we believe that this program is a key means of encouraging biofuels and bioenergy projects using next generation feedstocks, and is a key means of de-risking the developing feedstock supply chain. We urge Congress to extend this program for at least 5 years in the next farm bill to ensure continued private investment and development of bioenergy projects through a critical transition period for the industrialization of 2nd generation biofuels and biopower generation.

Funding for future BCAP projects should be prioritized to optimize productivity and sustainability. Additional research and development efforts to determine best production and sustainability practices should be developed in conjunction with these BCAP projects, as well as in smaller-scale, focused projects.

Energy crop insurance

In addition to concerns about a market for their energy crops, farmers are concerned about agricultural risk. Establishment of a crop insurance program for purpose grown energy crops would help drive farmer adoption, and further encourage planting of these feedstocks to provide variety performance data and develop agronomic and other protocols to ensure the sustainability of their production.

A public-private partnership would drive development of the supply chain and new varieties optimized for different regions

The development of new feedstock crop varieties, and the evaluation of biomass production systems from these varieties in the context of a full supply chain, are generally considered to be the responsibility of private companies. However, the cost of capital for the emerging companies committed to this market is very high today, much as it is for those companies developing biorefinery conversion processes. The cost of capital will only come down when reliable production processes from new varieties has been established sufficiently that biofuel and power companies are willing to enter into contracts with growers to produce required amounts of biomass for bioenergy production. The required steps to enable the industry would benefit from efforts both from emerging feedstock genetics companies and academic/agency scientists.

A public-private partnership would provide industry the means to collaborate with agency scientists and land-grant universities, leveraging government resources, much like current partnerships being deployed by the DOE to support biorefinery development. These new partnerships can ensure that the best feedstocks are available when conversion facilities are developed, and that a viable supply chain for delivery of those feedstocks is established. A number of land-grant universities are already shifting academic priorities to support perennial crops for bioenergy, including Purdue University, University of Illinois, University of Kentucky, University of Tennessee, and Iowa State University—and we expect others to follow as interest in bioenergy continues to grow.

Agronomic and climatic trials

The first effort would be to establish watershed-scale trialing and agronomic practices to accelerate understanding of how different feedstocks are established, grown and harvested in different climatic regions, as well as help develop agronomic best production practices for farmers to ensure sustainability and further development of the upstream supply value chain. These trials and efforts would be undertaken with leadership from key agencies, like USDA and DOE, to work with land-grant universities and other local research centers to determine the productivity and adaptation of leading feedstock candidates in these geographies, as well as the convertibility and compositional characteristics of leading feedstock candidates. These results will be required for biofuels and power utilities to secure financial funding and resources needed to build new facilities in these regions.

Additionally, research in various local and watershed-scale trials would drive understanding of overall carbon and energy balances, including carbon sequestration and improvement in soil quality through development of below ground root systems, as well as establish practices to reduce the potential for the spread of seed or genes to relatives outside of production zones. These efforts would further drive private industry's development of the entire upstream supply value chain through delivery to refiner or power utility.

Feedstock development

The second goal would be funding of development of best feedstocks to supply to the biofuels and biopower markets. Leading feedstock suppliers have developed extensive germplasm collections with thousands of accessions and are beginning to undertake focused breeding and adopting cutting edge molecular markets and other genomic tools to help rapidly improve yield and other key traits. Government funding to accelerate this development will help ensure reduced land use and sustainable production with varieties using less nitrogen, having greater conversion efficiency, and less environmental effects than even today's figures, which are good.

If properly resourced, by 2015 this public-private partnership will deliver sufficient yield and performance data for leading feedstock varieties in various regions to enable biofuels refineries and electrical utilities to make investment decisions. Additionally, key agronomic practices for these varieties in those regions will have been identified, and work on energy and carbon balances, greenhouse gas emission analyses and carbon sequestration will be well underway.

By 2020, feedstocks tailored to particular end uses and conversion technologies will be developed and yield and performance data in diverse climatic regions will

be developed, and a set of best production practices for each region will have been optimized to ensure sustainable, long-term production of biofuels and biopower to meet our nation's renewable energy goals.

Conclusion

Mendel strongly believes that cellulosic biofuels will be a significant part of America's transition to renewable transportation fuels and more sustainable energy production. We see dedicated energy crops like Miscanthus and other energy grasses as the principal means for producing the cellulosic feedstock required for production of these fuels.

Mendel is committed to working with Congress, government agencies, and state officials and universities to accelerate and develop high-performing varieties and a robust supply chain that can compete with hydrocarbon fuels by 2020.